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THE AMERICAN
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VOL. 97. MARCH, 1925. No. 3.

EDITORIAL

"PATENT MEDICINES."

(Patent and Potent, Too.)

One of the redeeming joys of the English language is its proverbial ambiguity. Thus, words or phrases, which one may have long accepted as having certain fixed meanings, will often upon close observation, release entirely new interpretations.

So with the topic of this editorial.

What, by the way, is a "patent medicine"? The man-in-the street hardly knows what it is. Porous to propaganda as that impressionable person is, he has found it exceedingly difficult to arrive at his own opinion here, because he finds a great many differences of opinion among his informers.

If he believes the almanacs and the advertising pages of bilious newspapers, and the rabid recommendations of neurotic neighbors, he is assured that the patent medicine is a legitimate panacea for every ill from ague to zoogue, in the dictionary of drab diseases. If, on the other hand, he believes another channel of information, such as the altruistic, paternalistic and often imperialistic magazines, he will be convinced that all patent medicines are insufferable hoaxes—preying upon the native credulity of the weak—the ailing and the tortured.

And indeed, those who know the story of the rise and fall of the patent medicine industry can readily recall its halcyon days when there was no limit to its arrogance, its falsities and its criminal absurdities. Those were the days when human vultures sapped the life-blood from the frail consumptive and the cancer cripple. Those were the times when babies were swindled to sleep with morphine lullabies.

It is to the everlasting credit of certain pharmaceutical and med-

ical organizations, particularly the latter, that this malignancy was excised from the system of the nation. None remain today, of the vicious, loaded anodynes, the doped soothers and the preposterous "cures" that flourished but a decade or so ago—and no one regrets their absence except perhaps the dope fiend and the pervert.

For the story of the current patent medicine is generally not nearly so heinous and criminal. There are many, forsooth, who can speak with intelligence and with kindness of a few really efficient concoctions, that sell as package medicines. For instance, there is the weary daddy, whose first born shatters the tranquil night with his colicy broadcast, and then promptly finds peace and harmony in a given spoonful of that secret, undoped liquid that "children cry and sigh for." No wonder that daddy speaks well of a "patent medicine."

But, after all, when the pen commenced this bit of writing—it had no intention of discussing the *pros* and *cons* of patent medicines as such. Truthfully there are some matters such as this upon which this editor prefers to write on white paper only, with white ink, not indeed for lack of courage but rather because the subject only merits silent treatment.

However, it is to the newer "patent medicines" that this editorial is dedicated. (Perhaps it is sacrilege to use this wholesome word "dedicated" to such an unwholesome subject.)

This so-called "patent medicine" is a *patent* medicine—"patent" just as Webster defines it—"obvious or lucid." Here is a real justification for the use of this interpretation of "patent," for it accurately describes the new horde of so-called tonics and stomachics and tissue builders and blood revivifiers—whose content of alcohol is the most PATENT, obvious and lucid reason for their current popularity.

Volstead wished upon the practice of pharmacy enough misfortune when he obligated it to the licensed handling of medicinal liquors. The whole profession has been disparaged because of the perversion of a few malefactors in its ranks, whose perennial itch for gain saw in this new responsibility only an opportunity to etch that itch.

These same people are now adding to the troubles of the respectable practitioners of pharmacy by compounding and placing on sale these abominable "tonics and stimulants" under the guise of ap-

proved and authentic medicines, when in reality they constitute nothing more and nothing less than barroom bitters or camouflaged hooch.

Where are the lynx-eyed watchmen of the prohibition crew, whose business it is to pass on the authenticity of formulas for so-called medicines such as these? Is it downright ignorance or is it a convenient negligence that permits the governmental approval of a formula such as this?

Cinchona
Bitter orange
Calamus
Sarsaparilla } a mere sprinkle
Gentian
Rhubarb

ALCOHOL.....much more than a little, or a trifle less than an awful lot

Syrup .....some

Water .....some more

In its balmiest, most flaunting hey-day, the bitter Martini cocktail, kicked with much less animation than such Government approved, law-abiding and thirst-appeasing combinations.

IVOR GRIFFITH.

BOTULISM.

Botulism, the technical term for the condition originally called "sausage poisoning," is derived from the Latin word "botula," a sausage. It was in connection with this article of food that the first cases were noted. They occurred in Germany. Of late years true botulism, that is, disease caused by the toxin of the *Bacillus botulinus*, has been due to substances very different from sausage, numerous American cases having been reported from eating preserved olives and also from spinach. It is stated on good authority that the poisoning is entirely due to the toxin already existing as a result of the growth of the bacillus in the food, for the organism does not multiply in the human body.

Considerable literature has accumulated of late years concerning the several types of food poisoning. In many cases the poisonous

action seems to be due to cleavage products of proteins, caused by the common strains of micro-organisms. Milk and egg foods have long been known as liable to decompositions, especially in the warmer seasons. A cream-puff a day or so old, in hot weather may be capable of bringing a strong man almost to death's door, although it may not betray by taste or odor any condition of decomposition. These actions have been generally termed "ptomain poisonings," it being assumed that amine bases split off from proteins, are the cause. Selmi many years ago introduced the term, deriving it from the Greek "ptoma," a corpse. At the present time the tendency among toxicologists is to regard the term as rather vague. In botulism, the effect on the human system is due to the toxin produced by the growth of the bacillus botulinus in the food. It has not yet been isolated, but judging by the severe effects that have followed the ingestion of small amounts of infected food, it must exceed in virulence all our known poisons.

The subject has acquired renewed interest by the publication of a book by Dr. Gerald Leighton, Medical Officer of the Scottish Board of Health. The preparation and publication was brought about by the occurrence of a number of fatal cases in a summer resort in the Scottish Highlands. The locality, known as Loch Maree, is attractive as a mountaineering and fishing resort, and a hotel favorably known for its comfort and convenience is the sort of many persons during the outing season. As usual in such places, it is the custom of guests to make up day parties, for which the hotel provides lunches, principally sandwiches. On the fourteenth of August, 1922, several parties were provided with sandwiches, some of which were made from potted wild duck in glass containers. Eight persons were subsequently taken seriously ill, all of whom died within a week. The Scottish authorities of the district made an exhaustive inquiry, by which it was found that all the cases of illness must have been due to the wild duck meat. The number of sandwiches made of this meat was such that it is evident that only eight persons ate of it. Two of these were boatmen who had charge of fishing parties and the others were guests at the hotel. The symptoms were closely alike in all cases, differing mainly in severity, time of onset and duration. The initial symptoms were dizziness and double vision, followed by progressive paralysis of the ocular muscles, resulting in complete ptosis. Further involvement of the cranial nerves

developed, speech being affected and finally lost. Paralysis of the larynx occurred, the tongue could be protruded. In the later stages, the power of swallowing was seriously impaired, ultimately lost. In the final stages, a distressing symptom was the air hunger due to the accumulation of mucus in upper bronchi which could not be expelled owing to the paralysis of the muscles of the region. Paralysis of the heart occurred either synchronous with paralysis of respiration or succeeding. These were the two terminating conditions.

Bacteriologic examinations of all specimens were made and tests on animals. By a remarkable incident the *corpus delicti* was obtained, namely, one of the potted duck sandwiches. A boatman who had been given one of these had put it aside, and when taken ill called attention to that fact. The members of his household buried it in the ground near the house, in the original paper wrapping, this having been done to prevent it being eaten by chickens that were around. This sandwich was dug up, found to be perfectly intact. Small amounts of the meat in this specimen were found to be extremely toxic and well defined; cultures of the *bacillus botulinus* were obtained from it. An antitoxin prepared according to standard methods was found to be effective against inoculation of the bacillus, so the nature of the organism was proved.

HENRY LEFFMANN.

ORIGINAL ARTICLES

THE ROMANCE OF CHEMISTRY.*

Charles H. LaWall, Ph. M., Sc. D.

Picture to yourself a room in an ancient monastery. The high vaulted stone ceiling, discolored with age, is but dimly visible. The only illumination is the light shed by a terra cotta lamp of early form and the glow from a charcoal furnace which is being used to heat a curiously shaped glass vessel called a "limbeck."

Kneeling by the spout issuing from the "head" or "capital" of the alembic, as it is now called, a bearded brother of an an-

*One of a Series of Popular Lectures given at the Philadelphia College of Pharmacy and Science, Season 1924-25.

cient monastic order, garbed in a coarse robe gathered about the waist with a rough cord, is seen intently watching a colorless, pungent liquid which trickles therefrom into another curiously shaped glass receiving vessel.

Scattered about the laboratory are implements and vessels of iron, copper, silver, glass, and earthenware. Parchment scrolls, papyri, stylus and ink for writing, litter a table which stands near. The air is acrid with the fumes of escaping vapors. The expression upon the face of the kneeling figure is one of rapt concentration and beatific satisfaction. On one of the sheets of parchment lying on the table we discern words written in an archaic, cursive Syriac script.

You have just witnessed, in your imagination, one of the early experiments in chemistry, perhaps one of the attempts to prepare the "Elixir of Life," or the "Philosopher's Stone"; perhaps the earliest distillation of "aqua vitæ," as brandy was at first called.

Contrast this secret and empiric search for the greatest *ignis fatuus* of all history, one in which the quest lasted for nearly 2000 years, with this more modern picture. We see an auditorium capable of seating hundreds of persons, crowded to the doors with well-dressed men and women of the highest intellectual types of our own times.

A leader among the modern workers in physical chemistry is standing back of an illuminated reading stand. Alongside is a table on which is a complicated model of spheres connected with wires, resembling an orrery or planetarium of medieval times. Indeed, the simile is apt, for the combination of spheres and wires is a hypothetical atomic model, and the lecturer has been discoursing upon the similarity between the newest concept of atomic structure and the arrangement of the sun and the planets in our solar system.

We hear the terms "alpha particle," "isotope," "nucleus," "quantum," "electron," "proton," "atom," and "molecule." The audience begins to have a faint conception or comprehension of the magnitude of the subject, but is in doubt as to the practical possibilities of such profound research. The lecturer calmly concludes: "And so, if we can succeed in splitting off or knocking out of place the eightieth planetary electron of the metal we

know as mercury, by interatomic bombardment with alpha particles, we shall find that we have converted it into gold," and lo! the centuries have shrunk to nothingness, the scroll of time has rolled up.

The shades of philosophers and alchemists of ages past seem to have assembled for a roll call and approval of their labors. Thales, Anaximander, Leucippus, Democritus, and Empedocles of the early Greek school; Pliny and Lucretius of the Roman; Geber, Rhazes and Avicenna of the Arabian; Albertus Magnus, Roger Bacon, Raymond Lully, Basil Valentine, Paracelsus, John Dee, and Cagliostro of the later European period—all seem to have come back in spirit, and one instinctively thinks of Kipling's lines:

"After me cometh a builder;
Tell him I too have known."

Back through many centuries stretches the fascinating trail of man's effort in the direction of understanding the composition of matter and turning his knowledge to some practical advantage. The milestones on this trail are the discoveries that have been made—discoveries whose value has sometimes remained unrecognized for centuries. The landmarks on this same trail are the failures that have made possible a fresh start, or which have contributed by-products of unexpected value and entirely foreign to the quest itself. Today, when a new chemical compound is discovered, steps are immediately taken to ascertain what possible value it may have in the arts, in the industries, or in medicine. Contrast this with the past procedure.

In 1540, Valerus Cordus, a noted pharmaceutical worker and writer, first prepared the volatile liquid which he called "oleum dulce vitroli," and which we now call ether. Three hundred years elapsed before the true value of this discovery was recognized, and the practice of surgery revolutionized by its employment as an anesthetic.

Formerly it took years, decades, and centuries for scientific observations and statements to find their way to the lay mind. When Vitruvius, the celebrated Roman engineer, during the reign of Augustus Cæsar recommended that pipes of earthenware and not of lead be used for conducting water, his

reasons were based on the fact that lead workers or plumbers (*ab artificibus plumbarius*) suffered from chronic illness. It took more than a thousand years for the wisdom of his warning to be disseminated and heeded. How different is the case today! A few weeks ago when the gasoline improver, tetraethyl lead, caused the death of a number of workers in a research laboratory, the whole world was informed within a few hours of the dangerous character of the product in its concentrated form, and steps were immediately taken to minimize its dangers.

The accuracy of some of the measurements and the keenness of some of the observations of early Egyptian and Grecian astronomers and philosophers contrasts sharply with the stupidity of their speculations regarding the constitution of matter, which is the main province of chemistry.

About the time that Nebuchadnezzar was eating grass in Babylonia, Thales, the Greek philosopher of the sixth century B. C., attained the distinction of being the first example of an absent-minded professor by walking into a pool while raptly observing some celestial phenomenon. Thales is the first individual on record to have suggested the unity and indestructibility of matter. These views were also held by Anaximander, one of his contemporaries, who conceived, in addition, of an undetermined primal unit, the apeiron, which he assumed to be eternal in character and unlimited in extension.

Heraclitis, a successor of these two philosophers, believed fire to be the primeval element, to which Empedocles later added earth, air and water, making the quaternion, which lasted for many centuries as the basis for philosophic speculation. In later years some added salt and sulphur, others oil and spirit, and still others mercury, but no one seems to have even approximated the truth as exemplified in the modern ideas of chemical elements having relationships of mathematical certainty. Democritus, the "Laughing Philosopher," had theorized concerning what he called the atom, but there is a wide variance between his metaphysical notions and the atomic theory of Dalton.

These differences are not realized, however, when one reads Lucretius, the Roman poet of the first century A. D., who in his *De Rerum Naturæ* utters these remarkable lines:

"That you may know
That forms dissimilar coalesce in one,
And things are formed of differing elements;
As in our verse you many letters see
Common to many words, yet words and verse
As wholes dissimilar . . .
This common atoms may exist in things
The compound whole be yet dissimilar."

Matter is what concerns the chemist most. Even the wildest speculations of the philosophic mind from the time of Tut-Ankh-Amen to Sir Oliver Lodge were hardly prepared for the real facts as they seem to be demonstrated by the physical chemists of the past decade. Earth, air, fire and water did not satisfy the requirements for elemental substances after three of these had been found to be complex in themselves, and the fourth to be a manifestation of energy. The molecule for a long time had come to be regarded as a hard sphere made up of atoms of indivisible and untransformable character.

The mathematical consanguinity of the elements, as shown by Mendeleef's Periodic Syatem and Newland's Octaves, forced the development of a belief that they were intimately related but stable as to their identity. The chemical theories and practices of the entire nineteenth century respected this atomic sanctity, but the discovery of radium, the charter member of the elemental suicide club opened a new field of possibilities. Physicists who had for years been perfecting instruments of precision commenced to regard chemistry as worthy of some of their attention, and the most romantic chapter of science, the chapter which concerns itself with atomic and molecular structure, is now being written. Testing machines had been perfected with a compressing force of millions of pounds per square foot and yet so delicate in their adjustment that the slight pressure necessary to crack an egg shell could be measured by the same machine. Measuring devices are available for accurately determining the speed of light, which travels 186,000 miles a second. An instrument used by astronomers for measuring angular magnitude is capable of detecting an arc of one inch subtending a radius of 100 miles. A thermometer for making temperature measurements is so refined in its adjustment that the

heat from the flame of a match held many feet away can be recorded. Balances are in use that are so sensitive as to detect the 1/30 millionth of an ounce, and when we consider the spectroscope, which is four million times as sensitive as the finest balance, and the electroscope, which is a million times more sensitive than the spectroscope, we seem to be nearing the limit of human possibilities in the direction of physical measurements. All of these instruments and others almost equally amazing have been marshaled to aid in unfathoming the mystery of the molecule and of the atom.

Before we go back over the earlier trail, let us see what the modern physical chemist tells us about the molecule and the atom, as we know them today. The almost incredible statements and comparisons which follow are quoted from the writings of contemporary scientists of recognized authority.

First, as to the molecule. It is molecules that form the mass of matter. A molecule is composed of atoms which may be similar, as in the case of elemental substances, or dissimilar, as in the case of compounds. Water is a compound. It is symbolized as H_2O; that is, it is composed of molecules, each of which contains two atoms of hydrogen and one atom of oxygen.

It will doubtless astonish many of my hearers to learn that the physical chemist can determine the number of molecules in a given weight of many substances with greater accuracy than the census taker can ascertain the population of one of our large cities, and that the fixed weights of individual molecules and atoms have been determined to a closer proportionate degree than the average individual knows his own avoirdupois. If a single drop of water weighing a little over a grain were to be magnified to the size of the earth, the molecules would be only about the size of oranges.

A glass of water (about half a pint) contains ten million million million million molecules. We cannot grasp the magnitude of this number even when we see it written out in figures, so let us take another simile. If a single glass of water were to be dipped out of the ocean and then poured back, and if we can conceive of this original glassful of water being so diffused throughout all the oceans of the world that the distribution is

absolutely uniform, and if we should then dip out another glassful, we should find about 2000 of the original molecules of the first glass of water distributed throughout the second one, if we had any means of recognizing them.

Molecules of matter are not tightly packed together, even in the densest substance known. They are separated from each other by great distances in proportion to their size, and are in constant oscillating or vibratory motion, with a speed greater than any rifle bullet. Collisions are so frequent between them that it has been estimated that each molecule collides with another one about five billion times in every second.

A single grain of gold can be beaten into a leaf or sheet seventy-five inches square. This sheet of metal will be only 1/400,000 of an inch in thickness and still will be many molecules in diameter.

So much for the molecule.

In the now popular crossword puzzle, when one of the initiated meets a four-letter word defined as "a small particle," the word atom is almost automatically written down. As has been previously stated, the atom of Democritus is not the same as the atom of Dalton, and we are quite sure that that eminent member of the Royal Institution who in 1808 gave to the world his "New System of Chemical Philosophy," would be astounded at the knowledge which the scientist of today has about this smallest particle of matter. We are now informed that the atom, instead of being a solid structure, as once supposed, consists of certain "factors," as we shall call them, for so far as we can determine, they are not particles in the common acceptance of that term.

There are two of these factors only—the nucleus and the electron. The mass or weight of the atom is concentrated almost entirely in the nucleus. The electron is not matter at all as we know it, but is a manifestation of force. It has been described as a disembodied unit of negative electricity. The nucleus is supposed to be near or at the center of the atom, and gives to it its individuality. The electrons are spaced about this nucleus. Some physicists believe that the electrons revolve about the nucleus; others believe them to be in a state of violent commotion or agitation at some fixed distance from the center.

Take hydrogen, for example, the simplest and lightest atom known. It consists of a single electron and a single nucleus. The nucleus in the case of the hydrogen atom is called the proton. All nuclei are charged with (or may consist of) positive electricity. All electrons consists of negative electricity. The balance between these forces is the cause of the stability of the atom.

We cannot draw a diagram of the hydrogen atom to scale, for if we magnify the nucleus to a size that would be large enough to be seen by the naked eye, the electron would have to be magnified to about ten inches in diameter, and would have to be placed three hundred miles away to be in relative proportion as to distance.

Another illustration may help us to visualize atomic size and structure. Suppose an inch square of graphite were to be enlarged until it occupies a space equal to the entire orbit of the earth. This would make it 190,000,000 miles in diameter. The nuclei of the atoms would then be over one mile apart; the nearest electrons (two in number) would be 300 feet distant, while the four outermost electrons (four in number) would be one-fourth mile away.

All modern concepts of matter show it to be astonishingly open in structure. Does it not stagger the imagination? Composed of units of force only and as empty as the solar system, and the individual atoms so small that 5,000,000 atoms of helium, the next in size to the smallest, could be placed in a straight line across the diameter of the period ending this sentence.

And now come other physicists, who have been experimenting with sensitive microphones, and who tell us that they can hear the rushing of the atoms and molecules to arrange themselves in the "lines of force" when a piece of iron is subjected to the action of a magnet. We may yet hear the music of the spheres. The ancient philosophers never dreamed of anything so fantastic as the truth itself.

The same electrons of which we have been speaking are the units of force which produce electric phenomena. In the electric lamps which light the room we are now in, electrons are passing through the incandescent filament at the rate of 300,000,000,000,000,000 a second.

All of the known facts regarding atomic structure have been considered in connection with certain mathematical relationships with the result that we now know that the number of chemical elements is limited to ninety-two, all but five of which have been discovered and identified.

Chemistry, according to etymologists, is derived from the root word "Khem," the native name of Egypt, where the science had its earliest recorded start. As this root word means "black," in reference to the color of the rich soil of the country, chemistry had some literal warrant for being classed among the black arts in later days. It was originally called the "Hermetic Art," after the Egyptian, Hermes Trismegistus, and later the practitioners were called "Spagyrists," from a title coined by Paracelsus in the fifteenth century. At first a mysterious and occult art, later an empiric practice, it has developed into a science of the first magnitude. Requiring a profound knowledge of its theoretic concepts, its practical applications are so easy and so fascinating that many a high school pupil considers himself a chemist when he has learned the names and symbols of the more important elements and can carry out a few simple experiments.

Who was the first chemist, or rather "alchymist," in history? Some of the early writers claim to trace the art back to Adam, others to Tubal Cain, and still others to Shem, the son of Noah—stating that the original form of the word was "Chem," and reasoning therefrom that the word alchemy was thus derived. Later historians did not fail to include Moses, for he proved his rank as an adept when he reduced the golden calf to a condition of potability and gave the children of Israel the first "gold cure."

Solomon, of course, was credited with esoteric knowledge concerning transmutation. Ophir, the alleged source of his supplies of gold, silver, precious stones, ivory, apes, and peacocks, was so far distant that his fleet required three years to make a return trip. These early higher critics state that so far as gold was concerned, Ophir was but a subterfuge, and that he had the gold carried there and back again in order to mislead the world as to its real source.

Hermes Trismegistus, or "thrice greatest Hermes," was probably an Egyptian priest who lived before the exodus of the

children of Israel from Egypt, and before the building of the great temple at Luxor, the Valley of the Kings. By some he is identified with the Egyptian God Thoth. He must not be confused with the Hermes of the Greeks. The hermetic writings, many volumes in number, cover a considerable period of time and are not the work of one person. They are concerned with metals and alloys, glass and enamels, as well as the preparation of medicines. Alexander the Great is said to have discovered the tomb of Hermes near Hebron and found therein a slab of emerald, upon which was written in thirteen sentences the essential secrets of alchemy in metaphorical and allegorical expression. Hermes is alleged to have presented this jewel to Sarah, the wife of Abraham, and it was afterward lost for many years. The traditional wording of the inscription was handed down for many centuries as an inspiration for the search. We pay tribute to Hermes in our use of the word "hermetical" in reference to the closure of a vessel, such a seal being in conformity with alchemistic practice in the carrying out of certain operations or the preservation of valuable substances.

1. Ancient Distilling Apparatus. (Peter's Pictorial History of Pharmacy. G. P. Engelhard & Co., Chicago, Ill.)
2. Hermes Trismegistus.
3. Birth of the Philosopher's Stone. (Follies of Science, Dolton.)

The technical secrets which were handed down through generations of metal workers, jewelers, painters, glassmakers, and potters, were not embodied in any treatises or works as yet discovered, but it is contended by several modern historians

that the Egyptian lore was in this way transmitted to the artisans of Greece and Rome and preserved during the dark ages in the monasteries and workshops of Italy, France and Spain.

We are not certain that the Egyptian metal workers believed in the transmutation or sought to accomplish it. They were clever in the knowledge of the metals of their time and had named a white alloy of 20 per cent. silver and 80 per cent. gold "Electrum," in the probable belief that it was a distinctive metal. They knew also that arsenic had the property of giving a white color to many metals and that copper could be given the color of gold by the addition of cadmium.

Such Egyptian documents as have been discovered and preserved, having to do with these arts and practices, date from about the third century A. D., and are probably the ones referred to in an edict of Diocletian, who, in the fourth century, ordered all Egyptian books dealing with the making of gold and silver to be burnt. It is probably that the cleverness of the jewelers and silversmiths and goldsmiths in the matter of imitating metals was the principal causative factor in this decree. It will be remembered that Archimedes' dramatic discovery of the utilization of the principle of specific gravity in the differentiation of base and noble metals had its inception in the need for proving the genuineness of the crown of King Heiro of Syracuse, in the third century.

The Mesopotamians converted astronomy into astrology, and it is their influence that probably led to the association of the planets with the metals which developed shortly after the Christian Era and which persists in names of elements and chemical compounds, even in our time. The original classification included electrum, the alloy of gold and silver, believed by the Egyptians to be a distinct metal. The coupling of heavenly bodies and metals was at first as follows:

Sun	gold
Moon	silver
Jupiter	electrum
Mars	iron
Venus	copper
Mercury	tin
Saturn	lead

When, in about the sixth century, electrum was found to be an alloy, tin was transferred from Mercury to Jupiter and the metal mercury, or quicksilver, which had been given no place previously, was transferred to Mercury.

regulus of metals
chalx of metals
alkalies
acids
salts
phlogiston
regulus of silver
mercury calx
arsenic
gold
iron
lead
mercury
silver
sulphur
Sol (sun) or gold
Luna (moon) or silver
Venus or copper
Mercury or quicksilver
Mars or iron
Jupiter or tin
Saturn or lead
Stibium or antimony
sulphur
arsenic
alum
sal ammoniac
saltpetre
salt common
fire
urine
First, I began with of the which I continued for 9 together and obtained nothing. I then for some certain time proved a , but in vain. After that I used a of for 3 space and still found myself out of the way. I consyed all sorts of and and as the Geber, Archelaus, and all the rest of them have prescribed, and yet found nothing. In sum I attempted to perfect the whole work of alchemy by all imaginable and likely means, as by and other heats of divers kinds all of which are found in the books of yet without any success. I yet continually for 3 together studied the books of , that

1, 2 and 3. Alchemistic Symbols.
4. Writings from Mss. of Dr. Michael Maier. (Follies of Science. Dolton.)

This latter one is the only metal in which the name still applies without change. In the compounds of the other metals we still find names pointing to these early associations. Pharmacists and physicians still call silver nitrate "lunar caustic." Iron rust is still sometimes referred to under its former Latin name "crocus martis," and a pigment made from an iron ochre is known as "mars' red." Lead acetate or sugar of lead is sometimes Latinized as "saccharum saturni," and lead water as "aqua

saturni," and red lead is called "saturn red." Copper acetate or verdigris is sometimes referred as "crystals of venus."

At the time of the fall of the Roman Empire, when the spark of scientific knowledge was almost extinguished, we are indebted to the Arabians for "carrying on," and providing continuity of effort which made the Renaissance possible. There are three names of importance in this period from the eighth to the twelfth centuries: Geber, Rhazes, and Avicenna, and Geber, of the eighth century, is easily the greatest of these. He is said to have taught in the College of Seville. His full name was "Abou Moussah Djafaral Sofi," and the third of these names is spelled more variously than even Shakespeare's, but is usually given as Geber. No less than 200 works are ascribed to him, most of which, being in Latin, are probably spurious and are certainly not originals. Some of his Arabic manuscripts have been discovered, not all of which, however, have been translated.

It was during the period in which Geber worked that the art of papermaking was brought to the West from Samarkand. The decimal notation acquired by the Arabs from a now-forgotten race in India was just beginning to appear in European literature, which was then in its darkest period. Charlemagne then reigned in France, which was noted for its ignorance, profligacy and misery. The schools of learning at Bagdad, Alexandria and Cordova were then in their prime. The cruelty, treachery and fanaticism of the Moslems did not prevent the development of some really great figures among them.

Geber is the reputed discoverer of sulphuric acid, nitric acid, and nitrohydrochloric acid. The titles of the treatises ascribed to him are usually symbolic or figurative, as "The Book of Royalty," "The Book of Balances," "The Little Book of Pity," "The Book of Concentration," "The Sum of Perfection," and the "Book of Oriental Mercury." The language of many of these works is so obscure and so full of fine-spun metaphysical discussions as to account for the etymology of the word "gibberish." A short example will suffice:

> "Establish the equilibrium, the parallel with the aid of fire of three degrees, namely, the incipient fire, the medium fire, the extreme fire, which melts the elixir; the solid will melt like wax and afterwards harden in the air. It will penetrate and be introduced like a poison. The result will

conform to the operation if the substance is excellent. The operation will be only rapid with the preceding substance, it will be very solid, excellent, and very pure. Only one part will suffice for a million."

It was during the Arabian period that the oriental imagery cast its shadow over the language of chemistry. Metals were "killed," by heating in the presence of oxidizing substances, and then "revivified" by heating with a reducing agent. Thus, metallic lead, when heated in the air, is oxidized to litharge or lead oxide. If some of this litharge is then placed in a crucible with a few grains of wheat and heated, metallic lead again appears. The explanation is very simple from a chemical standpoint, but these early workers either did not know, or ignored the fact, that charcoal would produce the same result as the grains of wheat (which must be converted to charcoal for the reaction to occur), and so they mixed up chemistry and biology in a fantastic explanation of the facts.

Then, too, the liberation of a volatile solid by heat (sublimation, we now call it), as in the production of benzoic acid from benzoin (in which the brown, unattractive looking, resinous mass yields beautiful white crystals upon heating under proper conditions) was likened to the blossoming of a flower, and so these sublimable substances or products were called "flowers," and we still have the term "flowers of sulphur" in everyday use, because it is purified by sublimation now just the same as was done more than a thousand years ago when the metaphor originated.

Albert von Bollstadt or Albert Groot, who, upon joining the Dominican order translated his name into Latin as Albertus Magnus and who was known as the "Universal Doctor," was a notable figure of the thirteenth century and became Bishop of Ratisbon. He was an indefatigable worker in all branches of human knowledge and was described in the Great Chronicle of Belgium, a century after his death, as *maximum in magia, major in philosophia, maximum in theologia, Doctor Universalis.* At the time in which Albertus Magnus lived, the Universities of Oxford and Cambridge had just been instituted, while the University of Bologna dominated the world of learning with its 10,000 students.

Albertus had probably become acquainted with several im-

portant works of the tenth, eleventh, and twelfth centuries—the *Mappa Calvicula,* which describes the testing of metals by the hydrostatic balance, utilizing the principle discovered by Archimedes, in a more scientific form; the *Book of Seventy,* which was believed to be a translation of one of Geber's manuscripts, and the *Liber Sacerdotum,* which concerns itself with colors, precious stones and minerals. The latter is a very important work, evidently based upon Egyptian tradition. It contains recipes for making alloys, for coloring metals, for soldering metals, for tinting glass, and making dyes, and also for the transmutation of metals and making imitations of precious stones. It is equipped with an Arabic-Latin lexicon for the use of translators and users.

The works of Albertus Magnus were given titles descriptive of their contents, as "Of Mineral and Metallic Things"; "Of Alchemy"; "The Book of the Philosopher's Stone." His language has the merit of being at least intelligible and he is the antithesis of Geber in many ways. He first used the word "affinity" to denote chemical combination. He named the metallic sulphates "vitriols," and we still use the names "green," "white," and "blue" vitriol to describe the sulphates of iron, zinc and copper, respectively. He was a skilful, practical chemist, and was one of the earliest authors to intelligently describe the distillation of alcohol, which had, however, been known in a fairly concentrated form for some centuries.

Contemporary with Albertus Magnus is one who stands out as the greatest figure for many centuries—Roger Bacon, the first English scientist of importance. Roger Bacon was not so much a recorder and interpreter as an actual discoverer. He had the inspiration and the vision of the modern research worker, and according to the interpretations, by Dr. Wm. M. Newbold, of the Voynich Roger Bacon Cipher Manuscript, translated in part about five years ago, he was nearly a thousand years in advance of his time in the thoroughness of his scientific knowledge, which he had to conceal from his contemporaries because of the opposition of the Church to his work. He was a member of the Franciscan order and spent much of his life in Oxford and Paris, becoming acquainted with many great scholars and philosophers of his day. He cast aside much of the knowledge of his con-

temporaries as being naught but repetition of error. He had a knowledge of Latin, Greek, Aramaic, Hebrew, and probably of Arabic.

1. Albertus Magnus. (Alchemy, Ancient and Modern. Redgrove; David McKay, Philadelphia.)
2. Paracelsus. (Follies of Science. Dolton. Pharm. Rev. Pub. Co.)
3. John Dee. (Alchemy, Ancient and Modern.)
4. Count Cagliostro.

He was handicapped by living in a period when the oppression of scholarship by the Church had begun to be felt. In 1209 the works of Aristotle had been condemned and forbidden to be read or taught. Bacon was a fearless stigmatizer of pride, luxury, avarice, and other evils which were then prominently indulged in by Church dignitaries. In 1266 Bacon received a request from Pope Clement IV to transmit to him secretly copies of his writings. Bacon sent copies of his three greatest works, the *Opus Majus, Opus Minus,* and *Opus Tertius.* In 1277 he was tried and condemned by the Minister-General of the Order of Franciscans. Whether he was actually imprisoned or only forced into retirement is not quite clear, but it put a stop to his openly published labors, for his next, and last, acknowledged work was a theological discourse published in 1792, the year of his death. He was buried at Grey Friars, the Franciscan Church at Oxford.

Bacon's knowledge was not only profound, but his statements were prophetic of future discoveries. He was acquainted with astronomy and proposed to Pope Clement the rectification of the Julian Calendar, which was deferred until the time of Pope Gregory, over 300 years later. He was acquainted with lenses and had probably used both the telescope and microscope. He predicted navigation without sails or oars, vehicular transportation without horses or other animals, and machines for flying in the air. He also described gunpowder, but made no claim for originating it.

Bacon is alleged by some to have believed in the transmutation of metals. It is more likely that works attributed to him, making extravagant claims in this connection, were the work of imposters, seeking attention for their writings by ascribing their authorship to persons of high standing, a form of deception frequently practised from the time of Dioscorides to the seventeenth century, and making the labors of modern historians and commentators doubly difficult. It was in the period between 1277 and 1292 that the manuscript discovered by Dr. Voynich was probably written in the effort to transmit to future generations through the medium of a cipher, the knowledge which he feared to give openly to the world of his time.

Shortly after the time of Albertus Magnus and Roger Bacon

appeared another important work called "The Book of Fires." attributed to Marcus Graecus or Marcus the Greek. This work, which was a sort of techno-chemical receipt book of its day, deals extensively with inflammable materials and explosives for use in warfare. A formula is given for making "rocket" or "thunder" powder, in which one pound of sulphur, two pounds of charcoal, and six pounds of saltpetre are directed to be mixed together. Other proportions of these same ingredients approximate the composition of gunpowders and pyrotechnic mixtures employed today. Gunpowder was first used in warfare in a crude and clumsy way at the battle of Crecy in 1346.

This "Book of Fires" also concerned itself with other interesting operations, as the following quotation will show:

> "Take best old wine of any color whatsoever in a cucurbita and alembic with joints well luted and distil with gentle fire. That which distils is *aqua ardens*. Its virtue and property is such that if a linen cloth is dipped in it and kindled it will give a great flame. When this is consumed the cloth will remain entire as it was at first."

Albertus Magnus had verified the fact that by "sublimation" of wine there is produced a light, inflammable, supernatant liquid, and Arnold of Villanova later refers to the uses of this *aqua ardens* in medicine and also calls it *aqua vini,* and mentions that still others have called it *aqua vitæ*. The name "alcohol" seems not to have been commonly used until the sixteenth century, when it was frequently employed by Paracelsus.

Thomas Aquinas, the greatest of scholastics, a pupil of Albertus Magnus, differed from his preceptor in that the few writings which he left are almost unintelligible—much in the style of Geber. He first used the word "amalgam" to describe the combination of mercury with a metal.

Another contemporary of Albertus and Bacon was a French Dominican, Vincent DeBeauvais (*Vincentius Bellovacensis*). He is distinguished for having made the greatest compilation of knowledge of the preceding ages. It was called "The Great Mirror" (*Speculum Majus*) and comprised eighty books with nearly ten thousand chapters, and references to nearly 500 early authors. This work was not published in its entirety until 1473, nearly two centuries after his death.

About the time of Albertus Magnus, Thomas Aquinas and Bacon, Marco Polo, the Venetian explorer, was preparing his famous travel talks on the Orient, and had just reached Pekin in 1270, the first European to bring back authentic information from the land of silks and golden dragons.

Raymond Lully, a Spanish scientist and mystic, who in his youth was a courtier and man of pleasure, later a religious zealot and missionary, founded a new philosophy, for which he was denounced as a heretic. After his death, as a martyr, for he was stoned to death by the Tunesians whom he tried to convert, he narrowly escaped beatification as a saint, and his relics worked miracles in Majorca and colleges were founded in different parts of Europe for teaching his philosophy. As the last and contrasting scene in this eventful history, his fame has been handed down as an alchemistic adept who discovered the elixir of life and prolonged his age for centuries.

Lully was the author of 486 treatises, most of which were upon literary, moral, metaphysical and theological subjects. About seventy, however, concerned themselves with medicine or chemistry. He was probably a pupil of, or was inspired by Roger Bacon. Lully is the subject of one of the most interesting traditions in chemical literature. He is said to have been invited by Edward II of England to visit his realm, which he did, and was introduced to the King by John Cremer, Abbot of Westminster. Edward, under pretense of doing honor to Raymond, gave him an apartment in the Tower of London and then commanded him to replenish the royal coffers by the exercise of his alchemistic art. Tradition goes on to relate that he transmuted, at the King's behest, enough base metal into gold to enable the coinage of six millions of gold nobles. The coins issued at this period are known to antiquarians as "Rose nobles," and their assay proves them to be of purer gold than any other gold coin made in those early times. It is further stated that Lully was so beset to continue this work that he had to leave the Tower secretly and flee the country.

There are chronological discrepancies in the details of this story which impair its credibility, but there are several interesting sidelights which are a matter of actual record, and which serve to illustrate the belief in the possibility of such transmutation that was evident in high places. One of these is the fact

that in Lully's last will and testament he refers to the incident that he had converted 50,000 pounds of base metals into gold. Another is that some years later, Henry IV then being King, the following statute was passed: "None from henceforth shall use to multiply gold or silver or use the craft of multiplication; and if any the same do, he shall incur the pain of felony." This statute was repealed by Henry VI, who ventured to replenish his coffers by "alchymy," and his statute discusses the feasibility and virtues of the philosopher's stone, encourages the search for it and dispenses with all statutes and prohibitions to the contrary.

This drew forth so many offers of aid and the responses were so encouraging that the King later published a message to his subjects informing them that the happy hour was drawing nigh when he would pay all the debts of the nation in real gold and silver. It served to attract to the court a miscellaneous rabble of imposters almost equal to that attracted to the court of Rudolph of Bohemia at a later period. Henry issued three subsequent decrees authorizing the search for the philosopher's stone. In one of them he specifically includes priests because of their familiarity with miracles.

One of the charges brought against Protector Somerset at about this same period was that "You commanded multiplication and *alcumestry* to be practiced, thereby to abate the king's coin." Lully's principal chemical work was called the *Calvicula* (little key), which is couched in mysterious and for the most part unintelligible language.

Arnold of Villanova, of French or Spanish origin, was a contemporary of Lully. He was a theologian, a physician, and an alchemist. He wrote a number of alchemistic books with fanciful titles, among which were the *Speculum Alchemiæ* (the Mirror of Alchemy), the *Perfectum Magisterium* (the Perfect Master), *Scientia Scientiæ* (the Science of Sciences), and *Rosarium Philosophorum* (the Roses of the Philosophers). He was condemned as a heretic and fled to Sicily. After his death a number of his books were condemned and banned by the Church.

His alchemical writings are characterized by their obscurity and charlatanry. His medical works, especially those on poisons and on alcohol, are clearly written and very thorough for their

time, although he had an exaggerated idea of the value of alcohol as a remedial agent.

An alchemistic mystery of the fifteenth century concerns a character named Basil Valentine. There have been so many conflicting stories about him and his writings that modern chemical historians are divided into two groups, *i. e.*, those who treat of him as an actual character and those who view him as a mythical personage. He is alleged to have been a Benedictine monk at Erfurt in 1414, and is said to have concealed his writings in one of the pillars of the abbey church, where they remained for years until a thunderbolt partly destroyed the church and revealed their hiding place. If all of the works attributed to him were concealed about the abbey, it would have required the whole church instead of a single pillar to hold them. His name is most prominently associated with antimony. It is said that having tried the effect of antimony upon the pigs in the neighborhood, without more than a fattening result, so far as he could observe, he tried it upon his fellow-brethren of the monastery with such disastrous results that he named it "antimoine" (hostile to monks). He subsequently studied the subject further and embodied the results in a book entitled *Currus Triumphalis Antimonii* (the Triumphal Chariot of Antimony). The whole episode is open to question and the real authorship of the book is attributed to Johann Thölde of the early seventeenth century. Valentine is assigned to all of the centuries from the twelfth to the sixteenth, inclusive. The fact remains, however, that antimony is the name still given to this poisonous metal, although some etymologists trace its origin from the Greek roots "anti" and "monos," in recognition of the fact that it is never found alone.

By far the most picturesque and important character of those who, in spite of "errors enormous and manifold," added to the constructive knowledge of their times, was one grandiloquently called "Philippus Aureolus Theophrastus Bombastus von Hohenheim." There is no doubt or mystery about his existence. His portrait was painted repeatedly during his lifetime, notably by Rubens and Tintoretti, or pupils working under them, and he was the subject of numerous engravings and illustrations, often connected with attacks upon his standing and character. Robert

Browning in one of his longer poems has pictured him as a visionary but sincere character, a dreamer who finds martyrdom in his idealistic strivings.

Paracelsus was born in Switzerland in 1493, and died in Salzburg, Germany, at the early age of forty-eight. During his short life he managed to upset the entire scientific world, leaving the historian with a multiplicity of conflicting impressions. His disciples extol him as a skilful physician, a wise teacher, a great reformer, and a sincere, pious, and unselfish character. His critics accuse him of being a charlatan, an ignorant egotist, a drunken braggart, and a superstitious visionary.

It is certain that he traveled much in his early life and probably visited the Orient. His father was a physician of repute and probably encouraged him in his studies. There is no positive evidence that he pursued any systematic course of study or had ever received the degree of Doctor of Medicine. When, at the age of thirty-two, he returned to Germany, he at first went to Strassburg and was then invited to become city physician at Basel, Switzerland, which position carried with it the functions of a medical professorship in the then famous university of that city.

He entered upon his duties enthusiastically. His first act was to formally burn the textbooks of his predecessors before his classes and to renounce the infallibility of Galen and other ancient worthies whose teachings had been accepted implicitly for more than a thousand years. His pupils were interested and delighted. His contemporaries and rivals were shocked and scandalized. He induced the City Council of Basel to pass an ordinance subjecting apothecaries to supervision, which brought upon him the wrath of this group. He not only did not believe in transmutation but attacked the alchemists for pursuing such a foolish quest and directed them to turn their attention toward the search for remedies for disease. He acquired local fame by a number of marvelous cures. He was a voluminous writer, drawing almost entirely from his own experience and observations, as he read but very little. There are 234 publications ascribed to him, the majority of which are undoubtedly authentic. He had a clear and forceful style of expression. He believed that life was essentially a chemical process and stimulated

the use of chemical substances as remedial agents, animal and vegetable drugs having held undisputed sway for thousands of years. He founded what has come to be known as the iatrochemical period, or the period in which chemistry and medicine were brought together. His death, it is said, was hastened by the effect of injuries inflicted by assassins in the pay of the orthodox medical faculty.

Paracelsus is the first of the prominent characters, whom we have considered, to profit by the advent of printing, which had its beginning during his father's time. Then, too, he lived in a period when the spirit of exploration was manifested in the voyages of Columbus, DaGama, Magellan, and others, and the spirit of revolt was exemplified by Luther and Erasmus, who were contemporary with Paracelsus.

Paracelsus is called by the "Encyclopedia Britannica" the pioneer of modern chemists and the prophet of a revolution in science.

John Baptist van Helmont was born of a noble family in Brabant in 1557. He was educated at Louvain and became eminent in mathematics, medicine, and chemistry. He spent much of his life in chemico-physical experimentation. He was the first authority of note to dispute the elemental character of earth, air, fire, and water, which even Paracelsus had accepted with some modifications and additions. He originated the word "gas" and describes carbon dioxide very accurately and thoroughly, calling it "gas sylvestre," or "the gas that is wild and is found in out-of-the-way places." He believed in the philosopher's stone and claimed to have witnessed successful transmutations. He also sought ineffectually for another of the alchemistic myths, the "alcahest" or universal solvent. The illogical character of this quest seemed never to have occurred to these futile seekers. What would they have preserved it in had they discovered it, if it had the property that was claimed for it of instantly dissolving everything with which it came in contact?

We have taken but a hasty glimpse in the brief sketches of some alchemistic workers from the eighth to the fifteenth centuries, of but a few of the leaders, those who in spite of error had passed on to future generations something of value concerning the science in which they worked. Ben Johnson, in 1610, pub-

lished "The Alchemist," one of the satires for which he was famous. Cowley, at about the same time, wrote: "So though the chemist his great secret miss (for neither it in art or nature is) yet things well worth his toil he gains; and does his charge and labor pay, with good unsought experiments by the way."

Nearly a hundred names of those who must be considered as sincere even if misguided searchers, are recorded in the period that we have covered. We have considered only about a dozen of these and we have left untouched episodes of interest and personalities unusual enough to make a number of lectures like the present. We stand aghast at the literary output of these ancient worthies. Without stenographic help or the convenience of the typewriting machine, and with printing in its infancy or even before its advent, these old masters of ancient art wrote scroll upon scroll and tome after tome. With crude laboratory equipment which could be surpassed in any high school chemistry department of today, they made discoveries of great moment and observations which were to become the foundation stones of a mighty science. It must not be thought, however, that all of these laborers were sincere, or that charlatans and imposters did not take advantage of the wonderful possibilities in such a quest.

In the time of Queen Elizabeth, when a new world across the sea was beginning to claim the attention of adventurers and statesmen, the Court of Rudolph of Bohemia was the scene of the greatest assemblage of savants and swindlers, alchemistic tricksters, and scientific mountebanks ever known. Rudolph II, born in 1552, son of Maximilian II of Germany, nephew of Philip II of Spain, was at first King of Hungary, later also King of Bohemia, and in 1576 succeeded to the throne as King of Germany. He moved the capital from Vienna to Prague, cast the entire responsibilities of his titles upon his ministers and executives and devoted himself with great zeal to the accumulation of art treasures and the cultivation of science, not the science which we know today, but the lunatic fringe which included astrology, magic, and the baser sort of alchemy.

In a short, narrow street of Prague, known as "Gold Alley," lived the occultists and spagyrists. These came from all over Europe, attracted by the liberality of Rudolph, who entrusted

much of the detail to Dr. Von Hageck, the director of his laboratories. Among the ingenious frauds and impositions detected and described by Dr. Von Hageck were the following:

Some used double-bottomed crucibles, the false bottom being fusible and containing gold, which would appear in the flux after the operation. Others employed hollow tubes for stirring the ingredients, the gold being secreted within and the bottom being stopped with wax, which melted and allowed the gold to mix with the contents of the crucible when the apparently solid rod was used for stirring purposes. One adept had saturated a piece of charcoal with a solution of a gold salt and mixed this with the plain charcoal employed as a reducing agent in the flux itself.

Among the interesting characters who joined the hundreds drawn to Rudolph's court were the astronomers, John Kepler and Tycho Brahe. Kepler wrote several of his most famous astronomical works while at Prague and enunciated the principles which are still known as Kepler's Laws. Tycho Brahe was a Dane who was known as "the man with the silver nose." His nose having been severed in a duel was cleverly replaced with a metal nose which was cemented in place. Brahe, although he made several important astronomical discoveries which assured his fame to future generations of scientists, was more of an astrologer and occultist, superstitious to a degree. These two were not connected with the alchemistic rodeo, but another notable pair of international humbugs whom we shall now discuss spent some time there.

We may be doing John Dee an injustice by referring to him in this derogatory manner, but he certainly risked his reputation when he associated, as he did for some years, with such an acknowledged rascal as Edward Kelly. Kelly was not even his real name. He came to Oxford as Talbot, but left under a cloud and was later pilloried in Lancaster for forging title deeds and coining base money. After other unsavory episodes he associated himself with John Dee in 1582, when he was about twenty-seven years of age.

In 1584 Dee and Kelly joined the motley throng at Prague and were established by Dr. Hageck in his own house, situated near the celebrated Rathhaus, whose clock tower, built in 1484,

still stands, and not far from the University, established in 1383, in whose halls John Huss had started the disputations that led to his martyrdom by the Council of Constance.

Kelly's hold upon Dee seems to have been concerned with a mystical manuscript and a vial of unknown powder, supposed by them to be the philosopher's stone. Kelly had unearthed these treasures in the ruins of Glastonbury Abbey. Kelly was also a "skryer" or descrier of images or visions in a crystal ball, and Dee had a celebrated crystal ball or shewstone," which gave to Kelly an outlet for his talents. It was Dee's shewstone that had first interested Queen Elizabeth, although it is not of record that he or his skryer saw the vision of the defeat of the Spanish Armada which took place during this period.

The first experiment by these two adventurers at Prague was privately performed in the house of Dr. Hageck, when, by the mediation of a single drop of a red liquid Kelly "transmuted a pound of mercury into excellent gold." The report soon spread and Kelly was knighted and created Marshal of Bohemia. His inability to repeat the experiment when commanded to do so by the Emperor placed him in an embarrassing position and he was imprisoned twice. The second time he murdered one of his guards in an attempt to escape and avoided the death penalty by claiming the protection of Queen Elizabeth, which was accorded him. His continued incarceration led him to attempt another escape in which he was killed by a fall from his prison window.

Dee, in the meantime, had returned to England, where he was received by Queen Elizabeth and granted a license to practice alchemy. Dee had previously obtained the favor of the Virgin Queen by instructing her in alchemistic lore and in the uses of the shewstone. Dee's laboratory and library, after his return to England, were augmented by many books and instruments which he had collected on his journeys. He possessed thousands of rare books and manuscripts and scientific instruments of unique character and rarity. Dee himself was an indefatigable author whose books poured in a continuous stream from his facile pen each year from 1547 to 1583. He introduced algebra into England and was the first English author to use the now commonly employed signs for plus, minus and equality.

Dee's diary, a number of his printed works and a few of his crystals and instruments are preserved in the Bodleian Library and the British Museum. It is probable that he was sincere but misguided, but in the latter classification could be numbered many who occupied high position in his and in the succeeding century. We do know that, in spite of his unquestioned attainments and ability, he left nothing of constructive value in his writings.

One more character must be considered, comparable to Dee in many ways, although of a period two centuries later. Cagliostro is the *nom de guerre* of an individual believed to be identical with Guiseppe (Joseph) Balsamo, a Sicilian swindler of the latter part of the eighteenth century. "Count" Cagliostro, as he called himself, appears prominently for the first time in 1776 in London in connection with a Masonic organization called the "Order of Strict Observance." He next devised a new secret society which he called Egyptian Masonry, which was to reform the entire world. He claimed to have the power of transmuting metals, of a miraculous healer, and to be the possessor of the Elixir of Life. He figured in many court intrigues and scandals in various European capitals, the most notable of these being what historians call "The Diamond Necklace Affair," in connection with which he suffered imprisonment for a time in the Bastille. Surrounding himself with an air of mystery and affectation, he was credited by many with having in his possession the secret of continuing his existence through many ages, and to have had a history and experience comparable to that of the Wandering Jew.

Apparently possessed of great wealth of mysterious origin, he passed through the period from 1776 to 1789 like a meteor, and finally passed out after conviction by the Inquisition and imprisonment for life. When the battalions of the French Revolution entered Rome and attempted to release the entombed adept by force, they were informed that Cagliostro was dead. The familiar spirits, who had summoned the shades of the departed at many notable seances at his behest in Paris in the days of his glory, seem to have deserted him, and the illustrious proprietor of the "Grand Magisterium," as the philosopher's stone was sometimes called, died in loneliness and want.

A catalogue of alchemistic literature appearing in printed form from 1514 to 1739 comprises nearly 1000 titles and nearly half as many authors. We have entirely omitted reference to the Rosicrucians, with whom we could spend an entire evening, but they belong more in the classification of the Romance of the Occult, which may make a later chapter of this series.

The period of the Renaissance included several other important characters besides Valentine, Van Helmont and Paracelsus, whom we have briefly discussed. Georg Agricola was the famous metallurgist whose great work, *De Re Metallica,* served as a working manual until comparatively recent times. Johann Rudolph Glauber, whose name is associated with sodium sulphate, which we call "Glauber's Salt," and use mainly in veterinary medicine, believed that in this compound, which he obtained by the evaporation of the waters of a well-known German spring, he had found a panacea for all human ills, and called it *Sal mirabile,* the miraculous salt. He was the father of industrial and engineering chemistry.

The period of modern scientific chemistry began with Robert Boyle (1627-1691). Romance is not lacking, however, as scientific development proceeds. The erroneous phlogiston theory, enunciated by Stahl in 1717, was based upon the assumption that a fire-substance, *phlogiston,* escaped during all forms of combustion. This theory held undisputed sway until 1772, when it was logically disproved by the brilliant researches of the ill-fated Lavoisier, the father of quantitative chemistry, who was guillotined in 1794 by the French Revolutionists, and of whom it was said at the time that "It took them but a moment to cut off that head, though a hundred years, perhaps, will be required to produce another like it."

We must not forget the epoch-making discovery of oxygen by Joseph Priestley, whose apparatus consisted of a few bottles and tubes, and an old gun barrel, of which he quaintly says, to account for certain failures in his experiments: "A good deal will also depend upon the ingredients which have been used in the gun barrel in preceding experiments, for it is not easy to get such an instrument perfectly clean from all the matters that have been put into it."

And then, too, there is Karl Wilhelm Scheele, the humble

Swedish apothecary, who became eminent through his discoveries of many important substances, among which were the organic acids (citric, tartaric, and oxalic), the deadly hydrocyanic acid, or Prussic acid, as it was at first called because it was made from Prussian Blue; chlorine and oxygen, the latter discovered independently by Priestley. Scheele became so famous outside of his own land before his ability was recognized at home that when the King of Sweden, while traveling in foreign parts, heard of this remarkable scientist in his own kingdom, he sent word back for Scheele to be honored, but alas! he was so obscure that another person of the same name was knighted by the prime minister, much to the recipient's bewilderment and surprise.

The chemical revolution begun by Lavoisier was continued by Berthollet and culminated in the atomic theory by Dalton. Dalton was a versatile scientist who made the first systematic study of color blindness and who was one of the earliest students of meteorology. Dalton's conception of the atom differed from the primitive ideas of the early Greeks in that it had a mathematical basis which, after some minor corrections due to more accurate quantitative determinations, was so sound that it served for a century's marvelous development of both theory and practice. Dalton would not recognize the atom of Rutherford, Bohr, and Langmuir, but the newer knowledge is not incompatible with the older, being but an amplification of detail. We are not discussing chemical theory, however, but the unusual incidents which illumine the pages of what to some is a dull, drab physical science.

Sir Humphry Davy, the discoverer of a number of chemical elements and the inventor of the safety lamp as used in coal mines today for diminishing the danger of explosions, made his greatest discovery when he engaged Michael Faraday, for it was the latter's studies on electricity and magnetism, one hundred years ago, that made possible the electric light and the dynamo, but the unusual touch is found in the fact that Faraday originated the words "electrolysis," "anode," "cathode," "electron," and "ion"—words which have just come into their true heritage of usefulness within the past few decades.

The nineteenth century, the age of the world's greatest material and mechanical development, still furnishes instances of

workers who, searching for one thing, find another. If, when the youthful W. H. Perkin, later knighted for his discoveries, had found the synthetic quinine which he sought in 1856, the secrets of the tar barrel might not have been unlocked for another generation, and if the chemicals with which he was working had been of the purity that he believed them to be, the first coal tar dye would not have shown its purple hue in his test tube, for when he tried to repeat the experiment which revealed the dyestuff known as "mauve," he failed for a time because one of his reacting materials in the original work had been contaminated with an impurity of whose presence he was unaware.

If we had time and space we might go on indefinitely with interesting illustrations of unusual events or facts connected with chemistry. We can at least, however, appreciate the possibilities in sight and in our vista be reminded of the lines of Dante Gabriel Rosetti:

"Nay, come up hither. From this wave-washed mound
Unto the farthest flood-brim look with me;
Then reach on with thy thought till it be drown'd.
Miles and miles distant though the last line be,
And though thy soul sail leagues and leagues beyond—
Still, leagues beyond those leagues, there is more sea."

THE DRUGS OF THE NORTH AMERICAN INDIANS (II).

By Heber W. Youngken, Ph. D.

(*To be concluded in the April issue.*)

In a popular science lecture given at the Philadelphia College of Pharmacy and Science, April 17, 1924, which was published in the July, 1924, number of the AMERICAN JOURNAL OF PHARMACY, the writer discussed a representative number of drugs used by the Indians of this continent, their preparation and the ceremonies accompanying their use.

The present article is an exposition of additional data which he has collected along similar lines both from the available literature on various tribes and from informants who have been in close touch with some of the Indian tribes and their practices.

In the previous article vernacular names were employed for the plant and animal sources of the drugs discussed, since the lecture was presented to a mixed audience. In this article, however, it has been deemed advisable for purposes of reference to head the discussion of each drug with the botanical name of the plant source. A vernacular name is also given for such plants to which a common name has been widely assigned.

Abies concolor Lind. & Gord. (White Fir.) The oleoresin was collected from the vesicles on the trunk and larger branches by the Tewa and used in the treatment of cuts.

Acer negundo L. (Box Elder.) Sugar was obtained from the sap by all of the tribes living in vicinities where it was to be found.

Acer nigrum Michx. (Black Sugar Maple.) The sap of this tree was another source of sugar for many of the tribes.

Acer saccharum Marsh. (Sugar Maple.) Sugar was prepared from the sap of this tree by many of the Indian tribes. A decoction of the inner bark was used by the Ojibwa for diarrhœa.

Acer Pennsylvanicum L. (Striped Maple.) The Ojibwa prepared an emetic from this tree. They scraped the inner bark from four branches, each two feet long, placed this in a cloth bag and boiled. The liquid which could subsequently be scraped out of the bag was swallowed to produce vomiting.

Achillea lanulosa Nutt. (Yarrow.) This composite herb was extensively used by the Zuni and Pueblo Indians of Mexico and the southwestern United States. The entire plant was ground and mixed with cold water and applied to burns. The secret fraternities who performed with fire chewed the flower heads and roots and rubbed this mixture on their limbs and chests previous to passing hot coals over their bodies. Those who danced in fire employed this same mixture for bathing prior to the exhibition. They also placed some in their mouths before taking live coals. It is said that this medicine enabled them to hold the hot coals in the mouth as long as a minute. The Cheyenne tribe drank an infusion of the plant for coughs and a tea made from the leaves for colds and nausea.

Achillea Millefolium L. (Milfoil.) The Menomini tribe of Wisconsin employed a hot tea, made by steeping the leaves, as a febrifuge. The leaves were also used by this tribe as a poultice for rash in children.

Actæa alba (L.). Mill. (White Baneberry.) The roots were employed by the Penobscot Indians in the form of a decoction for stomach trouble.

Actæa arguta Nutt. (Western Baneberry.) The Cheyenne tribe used an infusion of the root and stems which they administered to their women to make the first milk secretion pass off quickly. Better results were claimed if *Mertensia ciliata* Torr. was boiled with it. It was prepared for use by rolling the roots in linden leaves and baking until black in color. From this an infusion was made and taken by direction of the Indian doctor for having swallowed hair.

Acuan illinoensis (Michx.). Kuntze. (Spider Bean.) The Pawnee used a decoction of the leaves as a wash for the itch.

Adiantum pedatum L. (Maidenhair Fern.) The entire plant was used for female disorders by the Menomini and Chippewa tribes.

Agastache anethiodora (Nutt.). Britton. (Fragrant Giant Hyssop.) The leaves of this plant were used by the Cheyenne and other western tribes for pains in the chest and weak heart, in the form of infusion.

Allium brevistylum S. Wats. The Cheyenne tribe employed the bulb and stem of this onion in treating a carbuncle. They ground these fine and applied the drug as a poultice. After it opened, they washed out the pus with a decoction of the drug.

Allium cernuum Roth. (Wild Onion.) To revive a person from a fainting fit, the Tewa put a piece of onion bulb to his nostrils.

Alnus incana (L.) Moench. (Hoary Alder.) The Menomini Indians employ the inner bark of the stem as a poultice to reduce swellings. An infusion of the root bark is used by them as an astringent wash for sores and also for saddle-gall in horses.

Alnus rugosa (Du Roi) Spreng. (Hazel Alder.) An infusion of the inner bark is used by the Menomini as an alterative.

Alnus tenuifolia Nutt. (Mountain Alder.) The bark was used by the Zuni for dyeing deerskin reddish-brown.

Allionia nyctaginea Michx. (Wild four-o'clock.) The Pawnee employed the dried root, grown fine, as a remedy for sore mouth in babies. A decoction of the root was drunk by the women of this tribe after childbirth, to reduce abdominal swelling. The Teton-Dakota used this same preparation as a drink in case of fever.

They also boiled the roots with the rhizomes and roots of *Echinacea angustifolia* and employed this decoction as a vermifuge. The prescription of their doctors required the drinking of it on four successive nights at bedtime, after which, at the next evacuation it was claimed the worms would be voided.

Ambrosia elatior L. (Ragweed.) The bruised leaves were used by the Oto tribe in the treatment of nausea. The surface of the abdomen of the patient was first scarified and a dressing of the bruised leaves placed over the scarified area.

Ambrosia psilostachya DC. (Black Sage.) The Cheyenne Indians made a tea from the ground leaves and stems of this herb which they administered for cramps in the bowels and bloody stools.

Amelanchier alnifolia Nutt. (Saskatoon.) The Cheyenne tribe made a tea from the leaves which they employed in healing.

Amorpha canescens Pursh. (Lead Plant.) The Ojibwa tribe used a decoction of the roots for pain in the stomach. The Omaha tribe used the stems as a moxa in the treatment of neuralgia and rheumatism. They took the small stems, broke them into small pieces and attached them to the skin, over the painful area, by moistening one end with the tongue. They then ignited them and allowed them to burn down to the skin. The Oglala, another Plains tribe, used the leaves alike for smoking and for a hot drink.

Ampelopsis Quinquefolia Michx. (Virginia Creeper.) This was one of the medicines used by the Navaho in their Mountain Chant ceremony.

Amsonia brevifolia Gray. (Amsonia.) Bits of this root along with two others were chewed by the Zuni theurgist and the mass applied to a wound induced by the bite of a rattlesnake.

Anaphalis margaritacea var. *subalpina* A. Gray. (Everlasting.) The leaves of this herb represent the "strong medicine" of the Cheyenne. They were dropped on hot coals and the smoke was used to purify gifts which were left on a hill for the sun or the spirits. In former times, before going into battle, each man chewed a little of it and rubbed it over his body, arms and legs because of its supposed property of imparting strength, energy and dash and hence protection from danger.

Andropogon furcatus Muhl. (Beard-grass.) The lower leaf blades were chopped fine and made into a decoction by the Omaha-

Ponca Indians who drank the preparation for general debility and applied it to a cut which was made on the top of the patient's head for fever. The Indians had great dread of fevers because of the evil effects they were supposed to have on the mind.

Anemone canadensis L. (Meadow Anemone.) The root was used by the Omaha and Ponca for a large number of ills. It was applied externally for wounds and in a wash for sores and taken internally in the form of a decoction. The Ojibwa employed a decoction of the root for pain in the lumbar region.

Anemone patens L. (Spreading Anemone.) The Pawnee gave this plant to horses as a stimulant. It was mixed with a white clay and rubbed on the muzzle of the horse, causing the horse to snuff the medicine into his nostrils. The bachelors among the Ponca tribe rubbed the tops with saliva into the palms of the hands as a love charm. Other Indian tribes employed the crushed leaves as a counter-irritant in the treatment of rheumatism and neuralgia.

Anemonella thalictroides L. Spach. (Rue Anemone.) The Cherokees drank a decoction of the root for diarrhœa with vomiting.

Anemopsis californica Hook. (Yerba Mansa.) The root has a strong peppery odor and taste. It was used by the Indians of Mexico, Arizona and Southern California. Both decoction and powdered drug were applied to venereal sores. The powder was also applied to cuts and other sores as an astringent. The leaves were applied to reduce swellings.

Angelica atropurpurea L. (Purple-Stemmed Angelica.) The rhizome and roots are used by the White Mountain Apaches, the Yavapai, the Tewa and other tribes as a remedy for stomach disorders. For this purpose some tribes boil the root and use the decoction, others chew it. The Menomini prepare a hot plaster from the rhizome and roots which they apply to the side of the body opposite the pain.

Antennaria plantaginifolia Hook. (Plantain-Leaved Pussy Toes.) This plant was used by the Indians as a cure for rattlesnake bite.

Apocynum androsæmifolium L. (Spreading Dogbane.) Some of the tribes used the rhizome and roots in the treatment of syphilis.

Aquilegia canadensis L. (Wild Columbine.) The Pawnee used the seeds for fever and headache. The seeds were crushed and pow-

dered in an elm-wood mortar with an elm-wood pestle. The powder was then put into hot water and drunk.

Arabis glabra (L.) Bernh. (Tower Mustard.) An infusion of this herb was used by the Cheyenne to check colds in their early stage and as a general preventive of sickness.

Arisæma dracontium (L.) Schott. (Dragon Root.) The roots of this herb were used by the Menomini in the treatment of female disorders.

Artemisia canadensis Michx. (Canada Wormwood.) The Menomini prepared a tea from the leaves of this composite and Angelica root, which was used for suppressed menstruation.

Artemisia dracunculoides Pursh. (Fuzzy Weed.) The Mescaleros and Lipan tribes made a liniment by pounding the root and soaking it in cold water. This they applied to bruises, repeatedly, in order to keep the injured part cool and prevent swelling.

The Winnebago chewed the root and put it on their clothes as a love and hunting charm. The effect was supposed to be secured by getting to windward of the object of desire and allowing the wind to waft the odor thither. The Winnebago medicine man made an infusion of the tops and sprinkled this over the body of the patient to reduce fevers. The Pawnee applied a decoction of the tops externally as a rheumatism remedy.

Artemisia filifolia Torr. (Silver Sage.) The Tewa chewed the leaves and stems, which they swallowed with water or drank as a hot decoction for flatulence, indigestion and biliousness. They also applied a bundle of the plants to the stomach as a hot compress. The Pah Utes used a decoction of the plant as a liniment for bruises and swellings.

Artemisia Forwoodii S. Wats. (Green Sage.) The Tewa chewed the leaves and stems and swallowed the juice for sick stomach. They also employed an infusion of these parts as a remedy for chills.

Artemisia frigida Willd. (Little Wild Sage.) The western tribes employed a decoction of this herb for bathing. It was also taken internally by the women for irregular menstruation. The Zuni used it as a tea which they drank hot for colds.

Artemisia gnaphalodes Nutt. (Wild Sage.) This and other Artemisias were popular with many of the tribes of the western United States as ceremonial plants. An Indian who had broken

some taboo or who had touched any sacred object must bathe with *Artemisia*. It was always proper to begin any ceremonial by using *Artemisia* in order to drive away evil influence. Old timers used this and various other species of *Artemisia* for the purpose of exorcising evil powers. Cedar twigs or sweet grass were used as incense to attract good powers. There are Indians today who still employ any of the Artemisias as incense for this purpose at Christmas, Easter, Pentecost and on the occasion of funerals. A decoction of the plant is valued for stomach trouble and other ailments.

Artemisia ludoviciana Nutt. (White Sage.) The Pah Utes stuff wads of the fresh plant into the nostrils for nosebleed. They administer a strong tea to their women to assist delivery.

Artemisia tridentata Nutt. (Sage Brush.) The Tewa chew and swallow the leaves for cough. The Pah Utes drink a strong tea for headaches, colds and worms. The Santa Clara people employ the herb in the treatment of indigestion.

Artemisia Wrightii A. Gray. (Wormwood.) This plant was used by the Zuni in the sweat bath which is administered to relieve pains through the body caused by a heavy cold. It is held downward over a bowl of live coals while the maker of medicine-water of the Ant fraternity (who alone is privileged to administer it) rubs off the seeds on the coals. During this process, the patient stands nude, astride the bowl with head bent and entire body covered with blankets.

Aster Cusickii A. Gray. The Cheyenne prepared an infusion from the dried stems of this plant which they dropped in the ear for earache.

Aster hesperius A. Gray. (Gray Root.) Among the Zuni, the Priesthood of the Bow employed this plant in the treatment of arrow or bullet wounds. A tea was made of the plant. The arrowhead or bullet was removed, if possible, by squeezing. The wound was washed out with a twisted cloth dipped into the tea. A slender twig wrapped with raw cotton was then dipped into the tea and the wound again washed until thoroughly cleaned. Piñon gum, softened by chewing, was made into a pencil, rolled in the powdered root and inserted into the wound. The gum-pencil was then withdrawn, and a quantity of powdered root dusted into the wound; then a piece of finely ground piñon was moistened with spittle, put into the wound and bandaged in place. This treatment was repeated in the morning and at sunset. Previous to the dressing of the wound each

time, if the missile had not been removed, the medicine-man endeavored to extract it with pressure. As a rule not more than two days were required for the extraction of the bullet or arrow by this method. If it should not be removed in this way resort was had to the knife. The blossoms of this plant are crushed, sprinkled on live coals and the smoke inhaled for nosebleed.

Aster sp. An unidentified prairie aster was used by the Pawnee as a moxa. The stems were reduced to charcoal, which in pieces a few millimeters in length, were placed on the skin over the affected part and fired.

Astragalus canadensis L. (Little Rattle Pod.) A decoction of the root was used by the Teton-Dakota as a febrifuge for children.

Astragalus crassicarpus Nutt. (Milk Vetch.) This plant was used as an ingredient in war medicine by the Chippewa.

Astragalus striatus Nutt. The Cheyenne doctors powdered the leaves and stems of this species of milk vetch and used it by dusting it on the skin of patients suffering from poison ivy or eruptions from other poisonous weeds.

Atriplex canescens (Pursh) James. (Salt-bush.) The Zuni moistened the dried blossoms and root with saliva and applied these externally to cure ant bites. Bruised fresh blossoms are said to have been substituted at times for this purpose.

Bahia woodhousei Gray. The Zuni made a tea of this composite which they drank hot for sick headache.

Balsamorrhiza incana Nutt. (Balsam-Root.) The Cheyenne employed this perennial composite for stomach trouble, colds and headache. The leaves, roots and stems are boiled together and the decoction drunk for pains in the stomach. For headache, the face is steamed over the boiling decoction and some of the tea is rubbed on the part where the pain is noticed.

Baptisia bracteata (Muhl) Ell. (Black Rattle Pod.) The Pawnee ground the seeds and mixed the powder with buffalo fat as an ointment. This they applied for colic by rubbing on the abdomen.

Betula excelsa Ait. (Yellow Birch.) The Ojibwa scraped off the inner bark of this tree and the sugar maple and employed the mixture of both in the form of decoction as a diuretic.

Boebera papposa (Vent.) Rydb. (Fetid marigold.) The Plains tribes employed a decoction of *Boebera* together with *Gutierrezia* for coughs in horses. The Omaha tribes pulverize the leaves and tops

and snuff the powdered drug up the nostrils to cause nosebleed. This they claim relieves headache.

Botrychium virginianum (L.) Sw. (Rattlesnake Fern.) The Ojibwa bruised the root of this fern and applied it to cuts.

Bouchea Ehrenbergii Cham. The tribes of southwestern United States and Northern Mexico pounded up the leaves and small twigs of this Verbenaceous plant. mixed the drug with water, and applied this mixture to the head for headache.

Cacalia atriplicifolia L. (Pale Indian Plantain.) The Cherokee bruised the leaves and bound them over cuts, bruises and cancer to draw out blood or pus.

Callirrhoë involucrata (T. and G.) Gray. (Purple Mallow.) The Teton-Dakota used the root for several purposes. The dried root was powdered and set on fire, the smoke being inhaled for cold in the head. A decoction of the root was employed externally as a bathing lotion for aching parts and taken internally for pains.

Campanula Parryi Gray. (Bluebell.) The Zuni chewed the flowers and applied the saliva to their skin as a depilatory. They applied the chewed root with bandages for the reduction of bruises.

Canotia holocantha Torr. The bark of the root and seeds were boiled and the decoction used by the Apache in stomachache, diarrhœa and menstrual disorders.

Capsella Bursa-pastoris (L.) Medic. (Shepherd's Purse.) A cold infusion of the powdered leaves and stems was drunk by the Cheyenne for headache. The plant was steeped in water by the Menomini and the tepid water used as a wash for poison ivy rash.

Capsicum frutescens L. (Cayenne Pepper.) The fruits were used as a spice in preparing food by the Indians of Mexico and the West Indies at the time of the discovery of America.

Carduus ochocenirus (Gray) Greene. (Thistle.) This plant was placed overnight in a vessel of cold water. The medicated water was drunk morning, noon and at sunset by the Zuni as a remedy for syphilis.

Carex plantaginea Lam. (Plantain-leaved Sedge.) The medicine men of the Menomini tribe chewed the roots of this sedge and sprayed the spittle on the wounds of his patients which had been caused by snakebites.

Carum gairdneri (H .and A.) Gray. (Caraway.) The Cheyenne mixed the roots, stems and leaves with *Balsamorrhiza* (bark medicine) and boiled these together.

Cassia marilandica L. (Wild- or American Senna.) The Cherokees bruised the root and moistened it with water for poulticing sores and drank a decoction of the root for fever.

Caulophyllum thalictroides (L.) Michx. (Blue Cohosh.) The Wisconsin Indians employ a tea made from the roots for stomach disorders.

Castilleja sessiliflora Pursh. (Sessile Paintbrush.) The Menomini Indians macerate the leaves and flowers of this plant in bear oil or lard and use the ointment as a hair dressing and tonic.

Ceanothus Americanus L. (Red Root.) The leaves of this shrubby plant were used by Eastern tribes for a tea which was drunk for its stimulant properties. The Wisconsin Indians employ a tea made from the roots for stomach disorders.

Celtis occidentalis L. (Hackberry.) A decoction of the bark was used by the aborigines in syphilis. The fruits were pounded fine and used as a condiment for flavoring meat.

Cerocarpus montanus Raf. (Mountain Mohogany.) The Tewa tribe powdered entire young plants or leaves of old plants, added salt and stirred this mixture in cold water. This they drank as a laxative.

Cereus Greggii Engelm. The Apache used the root of this cactus, which they administered in decoction for stomach trouble and diarrhœa and in the form of powder as an application to open wounds and sores.

Chamælirium luteum (L.) Gray. (Blazing Star.) The rhizomes and roots were employed by the aborigines of Eastern United States for colic, worms and fever.

Chamænerion angustifolium Scop. (Fire Weed.) An infusion of the leaves and roots was used for hemorrhage of the bowels by the Cheyenne.

Chamæsyce serpyllifolia (Pers.) Small. (Carpet Weed or Spurge.) A decoction of the whole plant was drunk by young Ponca mothers as a galactagogue. The leaves were used by the Omaha tribe as a remedy for dysentery in children.

Chara spp. (Stoneworts.) Various species of these green algæ were esteemed by the Menomini for kidney trouble.

Chenopodium cornutum Benth. and Hook. (Goosefoot.) The Zuni doctors steeped the entire plant in hot water. The vapor was inhaled by the patient to relieve headache.

Chelone glabra L. (Turtle Head.) This plant was used by various aboriginal tribes as tonic, laxative and purgative.

Clematis Drummondii T. & G. The root and stem were used by the Indians of Northern Mexico and Southwestern United States to induce vomiting and diarrhœa. A decoction of the drug was taken for chronic indigestion.

Chlorogallum pomeridianum Kunth. (Soap Plant.) The bulb of this plant yields a large quantity of saponin and so was used by the California and Mexican Indians in washing.

Chrysanthemum leucanthemum L. (Ox-eye Daisy.) This plant was used as a remedy for fevers by the Menomini.

Chrysothamnus bigelovii (A. Gray) Greene. (Rabbit Brush.) The blossoms were used by the Zuni in dyeing yellow.

Chrysothamnus Greenei (A. Gray) Greene. The tops of this shrub, which occurs in many sections of Arizona, are used by the Navaho in measles and chicken pox. The whole body of the patient is rubbed with an infusion of this drug and afterwards is well covered. The eruption is said to darken rapidly and dry up.

Chrysothamnus nauseosus (Pursh) Brit. The stems and leaves were boiled together to make a decoction which was employed as a wash by the Cheyenne tribe for sores or other eruptions, including those of smallpox. In obstinate cases the decoction was drunk.

Cogswellia daucifolia (Nutt.) M. E. Jones. (Love Seed.) The seeds of this plant with the seeds of Wild Columbine, dried roots of Ginseng and dried roots and flowers of *Lobelia cardinalis* were used by the men of the Plains tribes as a love charm.

Cogswellia orientalis C. and R. Jones. (White-flowered Parsley.) The Cheyenne tribe used an infusion of the roots and leaves for intestinal pains and diarrhœa.

Collinsonia canadensis L. (Stone Root.) This plant was used by the Indians as a vulnerary.

Comptonia asplenifolia (L.) Aiton. (Sweet Fern.) The Menomini Indians gathered the leaves of this Myricaceous shrub and prepared a tea from them which they employed as a parturient. The medicine-women of this tribe powdered these and mullein leaves together and peppered it on the medicine they gave to the sick whom they hated for the purpose of killing them.

Coptis trifolia Salisb. (Gold Thread.) This plant was used by several northern tribes for cankers in the mouth and in an astringent lotion for sore throat and teething.

Coreopsis cardaminefolia (Torr. and Gray). (Coreopsis.) The flowers were used with other blossoms by the Zuni in the preparation of a mahogany-red dye.

Cornus Amomum Mill. (Kinnikinick). In addition to the various uses of this plant previously cited by the writer, the bark was the source of a remedy made use of by the Chippewa and Menomini tribes in the treatment of diarrhœa.

Cornus alternifolia L. filius. (Alternate-leaved Dogwood.) The bark of this shrub is employed by the Menomini in a liquid pile remedy which is forced into the rectum of the patient by means of a syringe made from the bladder of the deer or bear and a hollow duck bone. It is similarly administered for diarrhœa. A poultice of this bark and some other drug has been employed by this tribe in the treatment of cancer.

Cornus florida L. (Flowering Dogwood.) At the time of the discovery of America, the Delawares and other tribes used the bark for fever and colds.

Cornus stolonifera Michx. (Red Osier Dogwood, Red Willow.) The Cheyenne and other tribes used the white inner bark of this tree which they dried, powdered and mixed with tobacco for smoking.

Covillea tridentata (Cav.) Vail. (Creosote Bush.) (See *Larrea mexicana.*) This plant was used for a variety of ills by the western tribes. The Apache heated the tops over a fire and applied them as a poultice over the affected part in rheumatism. The Pima boiled the gum and gave it as a tea for diarrhœa. A decoction of the branches was used for stomach disorders by the Pima and Maricoba. The leaves and small branches were heated and applied as a poultice for pains in the chest. A decoction of the leaves to which salt was added was applied while hot for contusions.

Crassina grandiflora (Nutt.) Kuntze (Zinnia). The entire plant was used as a fever medicine by the Zuni. It was powdered between stones. The powdered drug was sprinkled over hot stones beside which sat the fever patient who inhaled the fumes. This treatment was accompanied with a sweat bath, the patient, stones and medicine being covered with heavy blankets. The powdered drug was also spat upon a bruise which was then bound with cloth. The blossoms were crushed and soaked in cold water in the preparation of an eye wash.

Croton texensis (Klotzsch) Muell. The Pueblo and other tribes of Zuni Indians employed a tea made from the entire plant as a purgative and diuretic. Sick babies were bathed with a decoction of the leaves.

Crypthanthe crassisepala (Torr. and Gray) Greene. The Zuni prepared an infusion from the powdered plant which they applied to the lower extremities for the relief of extreme fatigue.

Cucurbita fœtidissima H. B. K. (Fetid Wild Gourd.) The root of this plant was highly valued by the Western tribes who, according to the doctrine of signatures, believed it simulated the form of the human body and was either male or female. It was considered a remedy for any ailment, that portion of the root being used which corresponded to the affected part of the patient's body. The Tewa tribe stirred the powdered root in cold water and drank this mixture as a laxative.

Cucurbita perennis James. The Omaha and other Western tribes apply those roots which are large and long to piles with, it is claimed, good results. They mix the powdered root with water and drink this for pains and protracted labor. Only that part of the root corresponding to the area of pain is used. The pulp of the green fruit is used with a little soap to remove stains from clothing.

Cucurbita Pepo L. (Squash.) The Cactus fraternity of the Zuni used squash seeds and flowers externally to bring relief from the cactus needles after a whipping with the plant. The Menomini Indians employed the powdered seeds as a diuretic.

Cunila Mariana L. (American Dittany.) Eastern tribes used this herb as an anti-malarial and remedy against the effects of snake bites.

Cupressus thyoides L. (White Cedar.) The Ojibwa crushed the leaves of this conifer and applied them for the relief of headache. They also heated the leaves on hot stones and inhaled the fumes for this purpose.

Datura meteloides DC. (Sacred Datura.) This narcotic plant enjoyed extensive use by the Indians of New Mexico, California and other Western states. The Pah Utes employed an extract of the root as an intoxicant. A decoction of the entire plant was administered by a California tribe to their young women to stimulate them in dancing. The Mariposan Indians of California employed the same preparation in the ceremony attendant upon the initiation of

their youths into the status of manhood. The Mohave Indians of Arizona bruised the leaves and roots, mixed them with water, allowed the mixture to stand several hours and decanted the clear liquor, which they drank as a narcotic.

Among the Zuni the medicine is the property of the rain priests and directors of the Little Fire and Cimex fraternities, who are obliged not only to collect the drug but must deposit prayer-plumes to the sacred plant in order that their treatment may be successful. The powdered root is given as a narcotic, while the ground roots and flowers are applied to all kinds of wounds.

Diervilla lonicera Mill. (Bush Honeysuckle.) The Menomini Indians used the root as a mild diuretic.

Dirca palustris L. (Leatherwood.) The bark was used as a masticatory by the aborigines. A tea is made from the roots by the Menomini and drunk for kidney trouble.

Dithyræa Wislizeni Engelm. (Spectacle Rod.) The entire plant is boiled by the officiating Zuni theurgist who administers the tea for delirium. The ground plant is mixed with a small quantity of warm water and the preparation applied for the reduction of swelling of any part of the body.

Echinacea angustifolia DC. (Narrow-leaved Purple Cone Flower.) This plant was used by the Plains tribes and southern Indians as an antidote for the bites of reptiles and stings of insects. Burns were bathed with its juice to alleviate the pain. It was employed in the smoke treatment for headache. An infusion was made of its rhizomes, roots and leaves, which was drunk. It was also used as a remedy for toothache, as well as for distemper in horses.

Echinocystis lobata (Michx.) T. and G. (Balsam Apple.) The powdered root of this gourd plant was used as a poultice by the Menomini and in decoction as a tonic.

Echinospermum lappula Lehm. (Stickweed.) The Ojibwa placed the roots of this plant on hot stones in a ground-hole. The patient stood astride this with face downward and a blanket thrown over the head and inhaled the fumes for headache. The ground roots were sometimes snuffed for this purpose.

Ephedra antisyphilitica C. A. Mey. (Joint Fir.) This plant was taken as a tea for venereal diseases by the Indians of Mexico and Western United States. The Tewa tribe chewed the stems and leaves and also made a decoction of these as a diarrhœa remedy.

Ephedra nevadensis S. Wats. (Teamster's Tea.) The Zuni made a tea of the aerial part of this plant which was drunk during the first stage of syphilis.

Ephedra viridis Coville. (Brigham Tea.) The Navaho and other tribes of Southwestern United States and Northern Mexico employed a sweetened decoction of the tops and young twigs of this shrub as a cough medicine.

Epilobium angustifolium L. (Great Willow Herb.) The root of this plant is used by the Menomini in a wash for swellings.

Equisetum arvense L. (Common Scouring Rush.) The Cheyenne prepared an infusion of the stems and leaves of this horsetail and poured the fluid down the throat of a horse that had a bad cough.

Equisetum sp. (Scouring Rush.) The Tewa administered a decoction made from an unidentified species of horsetail to babies as a cold and diarrhœa remedy.

Equisetum hyemale L. (Scouring Rush.) The water in which this species was boiled was drunk by the Menomini for kidney trouble and by the women of this tribe to clear up the system after childbirth.

Equisetum sylvaticum L. (Wood Rush.) The plant was powdered and used as a styptic by the Menomini. This tribe also employed an infusion of the stems as a remedy for dropsy.

Erigeron canadense L. (Canada Fleabane.) The Cree Indians used a decoction of this composite for diarrhœa. The Zuni used the ray florets only. These they crushed between the fingers and inserted in the nostrils to cure rhinitis.

Erigeron salsuginosus (Richards) Gray. (Alaska Fleabane.) The roots, stems and flowers were made into a hot infusion by the Cheyenne which was drunk and the vapors inhaled for headache, dizziness and drowsiness.

Eriodictyon glutinosum Benth. (Yerba Santa.) This plant is used as a drug by the Indians of Southern Utah, Arizona and California. A decoction of the plant is taken internally or applied externally for rheumatism and partial paralysis. The dried leaves are used by smoking, chewing or in a tea for pulmonary affections.

Eriogonum alatum Torr. (Winged Eriogonum.) The root was pounded up and boiled by the Apache and the decoction taken for diarrhœa. For sinking fontanel in infants, the San Carlos Apache made a dough of flour and the ground root of this plant. It was be-

lieved that this dough when it dried pulled up the soft place. The Zuni employed a pinch of the powdered root in a cup of warm water morning, noon and sunset to relieve general miserable feeling or after a fall.

Eriogonum fasciculatum Benth. (Umbrella Plant.) The Zuni administered a hot decoction of the root after confinement to heal laceration. A hot tea was drunk for hoarseness and for cold in the throat. The powdered root was applied to cuts and to arrow or bullet wounds by the Priesthood of the Bow.

Eriogonum Jamesii Benth. (James's Eriogonum.) The root was used for sore tongue. A piece of it was placed in the patient's mouth by the Zuni theurgist, where it remained a day and a night except when removed so the patient could eat. When the theurgist removes the root, he places with it a piece of turquois and white shell beads and deposits all in an excavation in the river bottom in order that it may go to the Abiding Place of the Council of the Gods.

Eriogonum subalpinum Greene. The stems and flowers were made into a strong tea by the Cheyenne tribe and used to check prolonged menstruation.

Eritrichium micranthum Torr. *Eremocarya micrantha* (Torr.) Greene. The slender roots of this plant were employed by the Utah Indians in the preparation of a delicate yellow paint.

Erysimium sp. (Treacle Mustard.) The Zuni prepared an infusion of the entire plant which they applied to the forehead and temples to relieve headache caused by overexposure to heat. This medicine was also rubbed over exposed parts of the body to prevent sunburn.

Erythræa venusta A. Gray. (Centaury.) The Indians of Arizona and Southern California used a tea made from this plant as a remedy for ague.

Eupatorium occidentale arizonicum A. Gray. The Shumaakwe made cakes or pats from the flower heads together with the flowers of the squash and other plants. A portion of the cake was placed in a little water and the infusion applied externally with rubbing by the theurgist as a specific for rheumatism and glandular swellings.

Euphorbia corollata L. (Flowering Spurge.) This was used by the aborigines as a purgative.

Euphorbia hypericifolia Torr. (Milkweed.) This juice was

applied to sores and sore nipples by the Cherokee. It was rubbed on the skin for eruptions especially on children's heads and used in connection with other herbs for cancer. A decoction was taken for venereal diseases.

Euphorbia Ipecacuanha L. (American Ipecac.) The root of this plant was used as an emetic by the Indians of New Jersey.

Euphorbia polycarpa Benth. (Golendrina.) A strong decoction of this plant is applied to snake bites by the Indians of Arizona and Southern California. The Pueblo tribe uses the young plant as a galactagogue. It is mixed with warm gruel made of white cornmeal and taken for retarded flow of milk after childbirth.

Euphorbia serpyllifolia Pers. (Thyme-leaved Spurge.) This plant is used by the Pueblo as a substitute for the last. It is also used as an emetic and cathartic by the theurgist.

Eurotia lanata (Pursh) Moq. (Winter Sage.) The fresh root was chewed and the dried root ground between stones by the Zuni. The theurgist takes a quantity of either into his mouth and spits it into his hand. Placing both hands together he bows four times into them, that the good of his heart may enter into the medicine; he then expectorates on the palms of his hands, and, rubbing them together, applies the root to a burn which he binds with a cotton cloth.

Evernia vulpina L. The Western Indians boiled this lichen in water and thus obtained a deep yellow dye which they used in coloring their faces and porcupine quills.

Fallugia paradoxa Endl. (Apache Plume.) The Apache and Tewa women steep the leaves of this shrub in water until soft and wash their hair in the infusion to promote its growth.

Fouquiera splendens Engelm. (Ocotillo.) The root of this Mexican shrub was used by the Apache both for swellings and gonorrhœal dysuria. For swellings it was pounded up and applied to the seat of the swelling after the skin had been scarified. For the latter complaint, it was drunk in decoction.

Frasera speciosa Dougl. (Colombo.) The Cheyenne tribe powdered the dried root and leaves and used these for diarrhœa.

Fraxinus sambucifolia Lam. (Black or Water Ash.) The inner bark is soaked in warm water and applied by the Ojibwa for sore eyes.

Gaertneria acanthicarpa (Hook.) Brit. (Ragweed.) The entire plant was made into a tea by Western tribes which was drunk

warm for obstructed menstruation. The ground root was placed in a hollow tooth for the relief of toothache.

Galium Aparine L. (Goose-Grass.) The Penobscot tribe used this plant as a drug.

Galium tinctorium L. (Bedstraw.) The root was employed by the Indians for staining feathers and other ornaments red.

Galium triflorum Michx. (Fragrant Bedstraw.) The Stockbridge and Menomini tribes of Wisconsin use an infusion of this herb for kidney trouble.

Garrya flavescens Wats. (Silk Tassel Bush.) The Arizona Indians made a tea from the leaves which they drank for ague and colds. They obtained a violet coloring matter from the fruit of this shrub.

Gaultheria procumbens L. (Wintergreen.) Many of the aboriginal tribes were acquainted with the antirheumatic virtues of this plant. It was employed by them in the form of a tea either made from the leaves and fruits or from the entire plant.

Geaster sp. (Earth Star.) The spores of this fungus have been used by the Tewa as a remedy for a purulent discharge from the ear. They were blown into the ear through a tube of corn husk.

Gentiana puberula Michx. (Downy Gentian.) The root, often in combination with that of other plants, was used in the form of a decoction by the Plains tribes, as a tonic.

Geranium Richardsonii Fisch and Trauto. The leaves and rhizomes were used by the Cheyenne for nosebleed. The powdered leaf was rubbed on the nose and snuffed up the nostrils while an infusion of the rhizomes was drunk by the patient.

Geum strictum Ait. (Avens.) The Ojibwa drank a decoction of the roots for cough and soreness in the chest.

Gillenia trifoliata (L.) Moench. (Bowman's Root.) The emetic virtues of the root of this herb were known to the Indians, who made the early colonists acquainted with its properties. The Cherokee tribe also used the root which they pounded up and applied as a poultice to swellings.

Gillenia stipulacea (Muhl.) Trel. (American Ipecac.) This root was also used as an emetic by the aborigines.

Gilia multiflora Nutt. (Gilia.) The entire plant was used by the Zuni, who drank an infusion of it for headache and swelling of the throat.

Glycyrrhiza lepidota (Nutt.) Pursh. (American Licorice.) The roots of this plant were eaten by the Western tribes as a demulcent and tonic.

Gnaphalium decurrens Ives. (Everlasting.) This was considered one of the most valuable of medicinal plants by the Cherokee, who employed it in the sweat bath for various ailments and drank a decoction for colds.

Gnaphalium polycephalum Michx. (Common or Mouse-ear Everlasting.) Hot poultices were prepared by many tribes for sprains and bruises and decoctions were drunk hot for fever.

The leaves were used separately or with gall from the beaver's body by the Menomini in the preparation of a smudge which was blown into the nostrils of one who had fainted to revive him. The herb was also burned to fumigate the premises after the death of a member of the family to prevent the return of the troublesome ghost of the departed.

Grindelia squarrosa (Pursh) Dunal. (Gum Plant.) A decoction made from the entire plant was drunk by the Indians of Mexico and Southern California as a cure for colds. The Ponca tribe used a decoction for consumption, while the Teton-Dakota administered it to their children as a remedy for colic. The Pawnee boiled the tops and leaves and made a wash for saddle galls and sores on horses' backs.

Gutierrezia filifolia Greene. The blossoms of this plant were employed by the Zuni medicine-man in the preparation of a tea which was used as a remedy for retention of the urine.

Gutierrezia longifolia Greene. A mixture of this plant and tobacco was given at Santa Clara by the Tewa midwife to women in labor, as snuff. The patient was also fumigated by placing this plant on hot coals over which she stood wrapped in blankets. The same treatment is employed for painful menstruation. At Hano, a decoction of the plant is given for gastric disturbances. The fresh plants are chopped fine and rubbed on the skin around the ear to relieve earache.

Gutierrezia Sarothræ (Pursh) Britton and Rushby. (Broom Weed.) The Plains tribes gave a decoction of this bitter herb to horses for diarrhœa.

Gymnocladus dioica (L.) Koch (Kentucky Coffee Tree). The dried bark of the root was powdered and mixed with water by the Dakota, Omaha, Ponca, Winnebago and Oto tribes and used as a

rectal injection in obstinate cases of constipation. The Indians made their own syringes before the arrival of the white man. An animal bladder was used for the bulb, and a hollow, cylindrical bone, as a leg bone of a turkey, goose or other bird, was used for the tube. The bulb was attached to the tube by sinew wrapping.

When the powdered bark was put into the water its action was carefully noted. If the powder on touching the water started to circle to the right and gradually mixed, it was taken as a good omen for the recovery of the patient, but if it settled quietly to the bottom it was considered an omen of his death.

The powdered root was snuffed to cause sneezing and thus relieve headache and applied to the nosrtils when a patient was in coma. It was mixed with water and given to women during protracted labor. It was also used in hemorrhages and kidney trouble.

Hedeoma hispida Pursh. The Cherokee employed an infusion of the leaves as a remedy for colds and as an appetizer for the sick.

Hedeoma pulegioides Pers. (American Pennyroyal.) The Penobscot tribe of Maine used this herb as a remedy for suppressed menstruation.

Hedeoma Reverchoni Gray. The Mescaleros tribe employed the aromatic stems, which they rubbed in their hands, and inhaled the vapor for headache.

Helenium autumnale L. (Sneezeweed.) The dried, nearly mature flower heads of this herb were powdered by the Menomini and employed as a snuff for cold in the head. An infusion was made from the leaves and other herbs which was drunk as an alterative.

Helianthus annuus L. (Common Sunflower.) The Indians of Eastern Canada used the oil from the seeds of this plant to anoint their hair. The Teton-Dakota prepared a remedy for pulmonary affections by boiling the Sunflower heads from which the involucral bracts were first removed. The Zuni used the roots together with the roots of *Psilostrophe tagetina* (Nutt.) Greene *Amsonia brevifolia* Gray and *Ximinesia exauriculata* (Rob. and Greenm). Rybd. to cure rattlesnake bite. The wound was first sucked by the theurgist who, when satisfied he had extracted as much poison as possible, chewed bits of the three roots and applied the mass to the wound with a bandage. This treatment was repeated each day until the morning of the fifth day when an Indian woman, of the same fraternity as the theurgist, washed the patient's head with Yucca suds while the theurgist prayed for his recovery.

Helianthus occidentalis Riddell. (Sunflower.) The Ojibwa crushed the roots and applied these to bruises and contusions.

Hepatica acutiloba DC. (Sharp Lobed Hepatica.) The Cherokee made a tea from this herb or chewed the root for coughs. Those of this tribe who dreamt of snakes took a decoction of this plant and the Walking Fern (*Camptosorus rhizophyllis* (L.) Link. This produced vomiting and it was believed the dreams did not return. The roots were used by the Menomini as a leucorrhœa remedy.

Heuchera ovalifolia Nutt. (Alum Root.) This plant was used by the Cheyenne Indians in the preparation of a favorite rheumatism medicine. A tea made from the tops was drunk and the pulverized root was rubbed on the skin by the patient.

Heuchera hispida Pursh. (Rough Alum Root.) An infusion of the root is employed by the Menomini as a diarrhœa remedy.

Hickoria ovata (Mill.) Britton. (Shag Bark Hickory.) The Plains tribes made sugar from the sap and by boiling hickory chips.

Hoffmanseggia Jamesii Torrey. (James's Hoffmanseggia.) The Zuni soaked the entire plant over night in cold water and gave the infusion to sheep to drink that they might be prolific.

Hydrophyllum virginianum L. (Virginia Waterleaf.) The root was also used as an astringent by several tribes.

Hymenopappus filifolius Hook. (Low Tufted Hymenopappus.) The Zuni doctors employed the root in the form of a decoction which they drank as an emetic. They chewed the root and ejected it over swollen glands of their patients, after first rubbing the affected parts with mutton grease.

Hypericum ascyron L. (Great St. John's Wort.) The root is employed by the Menomini in a compound for the first stages of pulmonary tuberculosis. It is also used in a compound with black-cap raspberry root for kidney trouble.

Ilex verticillata (L.) Gray. (Black Alder.) The aborigines used the bark of this holly as an astringent, tonic and antiseptic.

Impatiens pallida Nutt. (Pale Touch-me-not.) The Omaha crushed the stems and leaves of this plant to a pulp and applied this to the skin for eczema, poison ivy and other eruptions.

Impatiens biflora Walt. (Spotted Touch-me-not.) Employed as previous species.

Ipomœa leptophylla Torr. (Bush Morning Glory.) The Pawnee used the large storage root of this plant in the smoke treatment as a remedy for nervousness and bad dreams. They also powdered the root and dusted it on the bodies of patients, in pain, with a deer or feather brush.

Janusia gracilis Gray. (The root was chewed by the Apache as a sore-throat remedy.

Juglans cinerea L. (Butternut.) Several of the Eastern and Western tribes employed the bark as a purgative. The sap was employed likewise.

Juglans nigra L. (Black Walnut.) The Ojibwa employed the green rind of the unripe fruit in staining and dyeing. Other tribes made a black dye from the root.

Juniperus communis var. *depressa* Pursh. (Prostrate Juniper.) The Penobscot tribe employed the fruits as a remedy for colds.

Juniperus monosperma (Engelm.) Sarg. (One Seeded Juniper.) The Indians regarded the Juniper as "hot" and used almost every part of it for "cold" conditions. The Tewa and Yavapai women were fumigated four days after delivery with juniper leaves placed on hot coals in a vessel or in hot water. Both of these tribes drank the decoction of the leaves for internal chills. The leafy twigs were toasted and then bound over a sprain or bruise to reduce the pain and swelling. The oleoresin is used as a filling for decayed teeth and the berries as a diuretic and chill remedy. The Zuni doctors roasted the twigs at the fireplace, then steeped them in hot water and administered the tea to women in labor as a remedy for constipation. The tea was also taken after childbirth to hasten the cessation of the flux.

Juniperus scopulorum Sarg. (Colorado Juniper.) The Cheyenne drank a tea made from the leaves for coughs and throat irritation.

Juniperus sibirica Burgsd. (Mountain Juniper.) The leaves of this species were also used by the Cheyenne tribe for cough and irritation of the throat in the form of a tea. In case of bad cough they chewed the berries and swallowed the juice.

Lactuca canadensis L. (Wild Lettuce.) The Menomini tribe applied the milk juice of this composite to poison ivy eruptions.

Lacnanthes tinctoria (Walt.) Ell. (Red Root.) The Seminole Indians used the root, in decoction, as an invigorating tonic.

Lappula virginiana (L.) Greene. (Hound's Tongue, Beggar Lice.) The Cherokee bruised the root and mixed it with Bear Oil as an ointment for cancer. They employed a decoction of the root or tops internally for kidney trouble. Forgetful persons drank a decoction of the plant from an idea that the sticking qualities of the

burs will be imparted to their memory. On account of a similar connection of ideas, the root was also used as a love charm.

Larix laricina (Du Roi) Koch. (American Larch.) Plasters were made by the Penobscot tribe of Maine by evaporating a decoction of the barks of this tree and the American Beech (*Fagus americana* Sw.) to the consistency of an extract and incorporating the pitch of the Norway Spruce (*Picea excelsa* Link). The latter was obtained by stripping the bark from the trunk of the standing tree and sorching the wood. The Ojibwa used the crushed leaves and bark as an application for headache. The fumes yielded by placing these on hot stones were inhaled for the same purpose. The Menomini used the fresh bark of the trunk and roots as a poultice and in a tea for inflammation in man and distemper in horses.

Larrea mexicana (see *Covillea tridentata* [DC.] Vail). A wash made by steeping the branches in water and the powdered leaves were applied to sores by the Apache. This tribe also used the gum which exuded from older branches as a styptic.

Lepidium virginicum L. (Peppergrass.) The Menomini apply the freshly bruised herb or a wash made by steeping the bruised herb in water as a cure for poison ivy.

Leptotænia multifida Nutt. A decoction of the roots was used by the Cheyenne for pains in the stomach.

Lespedeza capitata Michx. (Round-head Bush Clover.) The Omaha and Ponca tribes used the stems as a moxa.

Leucelene ericoides (Torr.) Greene. The entire plant was ground and mixed with cold water by the Zuni, who rubbed the infusion over the body to reduce swelling and relieve pain due to cold or rheumatism. A tea made of this plant was used by the Zuni women doctors to hasten delivery.

Liatris scariosa Willd. (Blazing Star.) The Omaha tribe chewed the corm of this plant and blew the cud into the nostrils of horses in order that they might be enabled to run well without getting out of breath. The leaves and corm were together made into a decoction and given to children for diarrhœa. The flower-heads mixed with corm were fed to horses to make them swift.

Lichen. An unidentified lichen was applied by the Tewa to the teeth and gums to cure toothache.

Ligusticum porteri Coult. and Rose. The Mescaleros chewed the root and drank a decoction of it for coughs and colds. They also

ground it and, after mixing with water, rubbed the mass on a sore part.

Ligusticum apiifolium A. Gray (Angelica.) This was a favorite medicinal plant of the Pah Utes. The root was bruised and employed as a poultice for pains and bruises. A tea made from the roots was used for pains in the stomach. As a preventive for catching a contagious disease, pieces of the root were placed in the nostrils.

Lilium umbellatum Pursh. (Western Orange-cup Lily.) The flowers were chewed or ground and applied by the Dakota tribe as an antidote for the bites of a poisonous brown spider.

Linum puberulum (Engelm.) Helier. (Yellow Flax.) The Zuni tied the fruit of this herb in cloth and squeezed the juice into the eye to relieve inflammation.

Lithospermum angustifolium Michx. (Gromwell). The roots, stems and leaves were used by medicine men or women of the Cheyenne and Zuni tribes. They were either ground fine by the Cheyenne and the powder rubbed an the part affected, as a remedy for paralysis, or made into a tea and rubbed on the head or face of a patient who was irrational because of illness. The drug was also employed by the Cheyenne doctor to keep sleepy persons awake. For this purpose it was chewed and spit in the patient's face and also rubbed on the chest over the heart. The fine hairs present on the leaves and stems produce a prickly sensation. The Zuni used the drug to relieve sore throat and swellings.

Lithospermum canescens (Michx.) Lehm. (Puccoon.) The root was used by Eastern tribes in the preparation of a purple dye.

Lithospermum ruderale Lehm. The Cheyenne employed the leaves and stems in the preparation of a poultice for the relief of rheumatic pains. For this purpose the leaves and stems were powdered and a portion of this was wetted and frequently applied over the painful spot.

Lobelia cardinalis L. (Cardinal Flower.) The Cherokee used the root for syphilis and as a vermifuge. The Pawnee employed the roots and flowers together with the roots of Ginseng and Angelica and the seeds of *Cogswellia dauciflora* as a love charm. The ground entire plant was one of the constituents of the pats made by the Shumaakwe fraternity of the Zuni.

Lobelia siphilitica L. (Large Blue Lobelia.) The whole fresh plant was employed by several tribes as a cure for syphilis.

Lonicera canadensis Marsh. (American Fly Honeysuckle.) The bark of this shrub is used by the Menomini as a genito-urinary remedy.

Lycium andersonii A. Gray. (Matrimony Vine.) A decoction of this plant was taken by the Apache for headache.

Lycoperdon gemmatum Batsch. (Puffball.) The Plains and other tribes used this and other species of Puffball as a styptic for any wound. They were particularly valued as an application to the navel of newborn infants. The Menomini mothers applied the spores to the chafed armpits and inguinal regions of their babies as an emollient.

Lygodesmia juncea (Pursh) D. Don. (Skeleton Weed.) The Omaha and Ponca made an infusion of the stems for sore eyes and as a galactagogue.

Lygodesmia spinosa Nutt. The fine silky substance at the junction of the roots with the branches is used by the Digger Indians to check the bleeding in gunshot wounds.

Machæranthera glabella (Nutt.) Greene. The entire plant was ground in the fraternity chambers of the Zuni, mixed with warm water and the tea given internally as an emetic. It was also rubbed over the abdomen for sick stomach.

Magnolia glauca L. (Sweet Magnolia.) The Indian aborigines drank a warm decoction of the bark, cones and seeds of this and other species of Magnolia for rheumatism and a cold infusion for malaria.

Malvastrum coccineum (Pursh) A. Gray. (Red False Mallow.) Western tribes chewed the plant and applied it to inflamed sores and wounds as a cooling and healing remedy. The Cheyenne employed an infusion of the ground plant as a vehicle for bad tasting medicines.

Matricaria suaveolens (Pursh) Buchenau. (Pineapple Weed.) The Cheyenne employed the flowers and leaves mixed with Horsemint and often with Sweet Pine as a perfume.

Mentha canadensis L. (Wild Mint.) This plant was used by all of the tribes as a carminative. It was steeped in water and sweetened with sugar. The Cheyenne tribe boiled the ground stems and leaves and drank the decoction to prevent vomiting.

Mentha piperita L. (Peppermint.) An infusion was prepared by the Menomini of Peppermint, Catnip and Wild Mint which was drunk as a pneumonia remedy. A poultice made from the leaves of

these three plants was applied to the chest of the pneumonia patient.

Mentzelia pumula Torr. and Gray. (Stick Leaf.) The Zuni powdered the root of this plant and inserted it into the rectum to relieve constipation.

Mertensia ciliata Torr. (Mountain Bluebells.) Among the Cheyenne an infusion of this plant was administered as a galactagogue, an infusion of the leaves for measles and an infusion of the powdered root for the relief of itching in smallpox.

Mitchella repens L. (Partridge Berry.) A decoction of the entire plant was used by the aborigines as a parturient. A tea is made from the leaves by the Menomini and drunk for insomnia.

Micromeria douglassii Benth. (Yerba Buena.) A tea is made from this plant by the California Indians which is used for fever and colds.

Monarda fistulosa L. (Wild Bergamot.) A decoction of the root is drunk by the Ojibwa for pains in the stomach and intestines. The leaves and flowers are used for the same purpose by the Teton-Dakota. The Winnebago use an application made by boiling the leaves for pimples. The Menomini employ the leaves and flowers in the preparation of a tea which is used for catarrh.

Monarda menthæfolia Benth. (Horsemint.) This plant was used by the Tewa tribe for a variety of ailments. It was ground to a fine powder and rubbed over the head as a cure for headache or all over the body as a cure for fever. A decoction of the leaves was used as a remedy for sore throat together with a quantity of ground leaves enclosed in deerskin or calico and worn around the neck of the patient. A decoction of the leaves is also used in fever.

Nicotiana L. (Tobacco.) The two most widely cultivated species appear to be *Nicotiana rustica* L., which was grown by all the tribes from the Mississippi eastward to the Atlantic Ocean as well as by the Winnebago, and *N quadrivalis* Pursh, which was grown by all the tribes along the Missouri River and its tributaries.

The Indians of Arizona, Utah, New Mexico and Southern California grew *N. attenuata, N. bigelovii* and *N. trigonophylla.*

Notholæna Fendleri Kze. (Cloak Fern.) The Tewa pulverize this fern and apply the powder to the lips as a remedy for cold sores.

Nuttalia nuda (Pursh.) Greene. Western tribes applied a gummy yellow juice obtained from this plant as a remedy for fever.

Nymphæa advena Ait. (Yellow Water Lily.) The submerged stems are dried and pulverized by the Menomini and the powder used as a poultice for healing cuts and swellings.

Onoclæa struthiopteris (L.) Hoffm. (Ostrich Fern.) The Menomini employed the fronds as a poultice and made a tea from the roots which was taken for urinary trouble.

Onosmodium occidentale Mackenzie. (False Gromwell.) An ointment was prepared by the Cheyenne Indians by powdering the leaves and stems of this plant and mixing the powder with grease. This was rubbed on the skin of the patient suffering from lumbago.

Opuntia Emoryi Engelm. The Indians of Southwestern United States and Northern Mexico use this plant to keep away disease. Whenever there is any contagion about, they place these cactus plants a short distance from their dwelling and in the four cardinal directions. Some of the woody internal part of the plant is tied on a string and worn around the neck to ward off contagion.

Opuntia humifusa Raf. Western tribes bound the peeled stems on wounds as a dressing.

Opuntia leptocaulis DC. (Slender Cactus.) The Pima ground this plant and gave it to children suffering from diarrhœa with whitish stools, in the form of a decoction.

Oreodaphne californica Hook and Arnott. The California Indians employed this plant alike to produce and cure headache by rubbing the leaves on their hands and face.

Orthocarpus luteus Nutt. The Nevada Indians obtained a delicate pink color from this plant.

Osmorrhiza Claytoni (Michx.) Clarke. (Woolly Sweet Cicely.) The Menomini eat the root of this herb as a tonic to increase their weight.

Osmorrhiza longistylis (Torr.) DC. (Sweet Cicely.) The roots were pounded up by the Omaha and Ponca to make poultices for boils. The Winnebago medicine man used the same remedy for wounds. A decoction of the roots was employed by several tribes for weakness and debility and by the Cheyenne for disordered stomach. The last named also employed a decoction of the roots, stems and leaves for kidney trouble.

Oxytropis sp. The Cheyenne powdered the root of this plant and mixed the powder with an infusion of Actæa or Mertensia roots and stems. This mixture was administered as a galactagogue.

Pæonia Brownii Douglass. (Peony.) The root was taken in the form of powder or decoction for colds, sore throats or pain in the chest.

Padus nana (Du Roi) Roemer. (Choke Cherry.) The Dakota, Pawnee and Omaha-Ponca used a decoction of the bark as a remedy for diarrhœa. An infusion of the powdered fruit was also used for the same purpose.

Panax trifolium L. (Dwarf Ginseng.) The Ojibwa chewed the roots of this plant and applied the mass to cuts to stop the bleeding.

(*To be Concluded.*)

ABSTRACTED AND REPRINTED ARTICLES

CHINA AND CHINESE THERAPY.*

William E. Shastid, A. M., M. D.

China, with almost a fourth of the world's people living in it and its dependencies, presents a subject of great interest and attraction. It is a country of great antiquity, a civilization probably antedating that of any other, with the exception of Egypt and Mesopotamia, and a government that has carried on continuously for forty or fifty centuries. Within the last few years she has changed her system of government from that of a monarchy to that of a republic. Since this change she has wobbled and staggered and lurched and, it appears, has well nigh fallen, but still she strives to adjust herself to Western ideas and modern methods of thought. Be it so, she has a great deal to commend her to the thoughtful consideration of modern people for the perpetuity of the government she formerly had and for her contributions made to the list of inventions which we call modern. A thousand years before Gutenberg, of Mayence, Germany, invented movable type the Chinese were using them and were printing from characters engraved upon the faces of stone blocks. In the fifth century A. D. this race invented the mariner's compass and a thousand years before Europe knew anything about gun-

*Reprinted from *Chicago Medical Journal*, Vol. XLVI, No. 4, October, 1924.

powder this same race was using it in firecrackers and fireworks of various kinds. Silks were used by them at a time of such remote antiquity that it is not known when they first cultivated the silkworm. The historian, Edward Gibbon, in his work "The Decline and Fall of the Roman Empire," says that during the palmy days of the empire silk was worth its weight in gold and was imported from China with great danger and great cost. The ceramic art of China is not equaled in the world, with the possible exception of Japan, and her porcelain factories have been running since about the third century A. D. If you play chess, next time remember you are playing a Chinese game dating from about 1200 A. D., and that playing cards were also invented by them at about the same date. At a quiet evening game at home next time you hear somebody say "mah jong" and the "jig is up" for you, as far as that particular game is concerned, blame it on the Chinese who invented it many centuries ago.

Notwithstanding their inventive genius of the past, their present methods of doing things impress the traveler with their oddities and eccentricities, tinctured with amusement. Instead of the compass pointing north as the cardinal point, it points south. The man wears skirts and the woman pantaloons. Now, some of you irreverent may say that it is getting that way in our country, but I feel assured in saying such is not the case. The Chinaman if he owns a horse, which is rare, and wishes to ride, mounts on the offside instead of the near side as we do. The military man wears two swords on his right side instead of one on his left. Instead of having pockets in his clothes he uses his hose for pockets. Instead of carrying a watch concealed somewhere in his clothes, he wears two pinned on the outside of his garment with both open faces showing. He begins to read his book by going to the last page and reading from right to left instead of left to right. If he gets perplexed and puzzled and wants to think deeply, instead of scratching his head like some other races do, he kicks the clog off his foot and scratches said foot on the sole to stimulate his reasoning powers. In building a house, the roof is first constructed, and the foundation is the last thing to be completed. The kitchen occupies the front of the house, the parlor the back. The carpenter draws the plane toward him to dress the lumber, and the teeth of his saw are set away from him, so that when he works he is always sawing in the direction away from himself. The Chinaman laughs at a funeral and weeps at a wedding. If

he is so angry at an enemy that he would like to kill him, he commits suicide figuring that his ghost will return and torment his enemy so much that he will suffer more than by taking his life. In his temple service he burns incense to his favorite god, and makes offering of his money—not real money, he is too practical for that—but gilded paper in imitation of genuine money. Now, while he appears to us very odd in his methods, he thinks ours are just as queer. He is a great farmer, inasmuch as his farm has been tilled for forty or fifty centuries, and the ground appears to be as fertile as it ever was. The reason for this seems to be that he has made an intensive study of fertilizers and these have been diligently and laboriously applied from year to year so that the ground has not been robbed of its plant-raising properties. As a rule, however, instead of applying the fertilizer to the soil alone he applies it in some way to the plant itself. Naturally, it would be thought that a nation which has contributed so much in the way of agriculture, invention, and art to the world; a nation which up to several years ago formed the largest empire that ever existed in the world—if we except the Russian—would as a matter of course excel in many other ways. No so. There is a want of uniformity of tissue in this mighty realm, and owing to climate, geography, and natural circumstances, combined with want of education in the great masses and an overriding superstition everywhere, this aggregation of peoples and provinces and countries falls far below our reasonable expectations.

In briefly sketching this outline of impressions, I have had in view a background for their queer ideas in respect to medical therapeutics. Of all civilized countries of the present day that lay claim to any degree of medical progress, this certainly is the strangest. Progress, if any, is carried on by some few physicians who have studied in America or Europe; the nearly 100 per cent. of native doctors are ignorant, credulous, and to a high degree superstitious. They are but one jump ahead of the barber or the butcher, and five jumps behind the tailor, builder, merchant and farmer. It seems that medicine is so implicated with superstitions of so many and various kinds that it has never evolved to any appreciable extent. It is impossible to catalogue in a short paper many of their tenets of practice, but I shall enumerate a few of their methods and beliefs.

At the head of their list of drugs, which are council-passed, as we may term it, stands ginseng. Now, as far as I am able to dis-

cover or find out from investigation, this drug, according to Western belief, has no therapeutic value at all. The Chinese believe it the great sheet anchor for all diseases, from an infected finger to tuberculosis. They believe that it gives strength and is a powerful tonic for the old. It is a great power in fevers and septic conditions, and is prescribed at times for almost any disease. It also seems that the Chinese believe in preventive medicine. I had never thought that, because of the fifty-seven different varieties of smell that assailed me in the narrow streets of Canton. But I have learned that if you stew the skins of black cats and dogs—black, let me repeat—that is a sovereign remedy, preventing smallpox, plague, fevers, and eruptions. Musk is another remedy of great value in their drug list but it appears not to be valuable as a nerve remedy, which many Western therapeutists do believe. They have one drug which we can agree on, and that is rhubarb. This is cultivated and also gathered wild and is, of course, the best kind that is now obtainable in the world's markets. They use it for the same purpose that other nations do. In Chinese apothecary shops they have packets of silk which contain dragon's blood † for sale. What this dragon is or what the beast looks like I am unable to say. I have read that a dragon was a fabulous animal, or in the words of the farmer who saw the giraffe for the first time, "There is no such animal." Another interpretation of what a dragon is or may be is the fossil remains of some prehistoric animals. This explanation is somewhat far-fetched for the reason there can be no blood with these fossils, but, for a fact, they do sell and use as medicine a solution of fine grindings from the fossil teeth and bones, which enjoys a high reputation for that "worn out" and "tired feeling." As is well known, the Chinese are the finest carvers of ivory in the world. The dust and fine particles are not allowed to go to waste but are carefully saved, and used to make a decoction, like our coffee is made, and is, according to them, a very valuable remedy for fever. Cups made from the horn of the rhinoceros are used in which to make various solutions, to be taken for severe maladies. Also in these cups are placed ground skins and horns which are guaranteed to act as antidotes against the most powerful poisons and give to

† And so have American apothecaries—Dragon's blood, which is a dark-red resinous substance, derived from a variety of calamus palm. (Editor's note.)

the patient the qualities of courage and endurance which were possessed by the animals which wore the skins and horns. The hoofs of young deer are highly prized because they are believed to give the users great fleetness of foot, and it is believed that in the interior of China the victor still eats the heart of his brave enemy to give him courage and fortitude and this is considered the highest compliment to the bravery of a fallen foe. One of their most cherished therapeutic treasures is a gum from certain trees that grow in the immediate vicinity of the grave of Confucius. Another choice drug is pills made of pingan tea which, taken at certain intervals, produces a calmness and tranquillity of mind that alleviates the distress, the asperities, and the difficulties of life. The druggist also keeps in his shop medicine (composition unknown) which is guaranteed to cure women of vanity and men of talking too much. I should judge this to be a very popular remedy and I do not know what the druggist would say when he got out of it, unless "I have something just as good." Grasshoppers ground up to a dry powder and administered in suitable doses is regarded as a sovereign therapeutic measure in cases of anemia, chlorosis, tuberculosis, and lack of vigor. When other means fail, a soup of scorpions adjusted to the symptoms in the case is given to lower fever and mitigate pain in the body and limbs. Their cure of dysentery merits attention from at least the standpoint of novelty, and that is, thrusting a needle through the tongue. I never saw this treatment carried out, but would judge it to be more drastic than the disease itself. One remedy that they employ seems to stand on the basis of reason and common sense, and that is a tincture made from iron filings and used as an astringent and styptic.

Among a people of such limited general education, dominated by superstition and a desire to be free from foreign influences and modern conceptions, we naturally expect to find a people influenced by amulets, charms, and devices of various kinds to protect their mental and physical health. Such is the case, and probably the Chinese are more concerned than either the Indians or Egyptians. The doctor there believes in them as much as the people, and his whole system of treatment savors of the superstitious and the mysterious. He is supposed to diagnosticate the sickness by the pulse alone, and if he can not do so he is classed with charlatans and fakers. If he calls to see a lady she puts her arm out from the couch hangings so that he only sees the hand and wrist and, having felt the pulse for a short

time, he suddenly makes his diagnosis and announces his treatment for the patient. Like the peddler and the barber, he does not keep office but goes about ringing a little bell, so that those desiring his services may avail themselves of them. It is a far cry from these crudities and mysteries of medical practice among the ignorant and superstitious to the real scientific physician. The latter, though, forms such a trifle in the mass of such a great population that it is almost negligible. But time and conditions are changing in the Far East, not only politically, economically, socially, but even scientifically. Quite a number of men each year, scientifically educated in the few available up-to-date schools, pursue their education in the great universities and colleges of Great Britain, France, and America. Our country has several schools, offshoots of our great scientific medical schools, which have taken root in the land of China, which comprises nearly one-third of the continent of Asia. It will take many years to educate enough Chinese physicians both at home and abroad to enlighten this seething mass of millions of people and lift them out of the darkness of mystery, superstition, and the worship of idols. There is hope for a people who were dressed in silk at a time when our forbears in Europe were wearing the pelts of animals for clothing. But for their early advancement as compared to other nations, their later advancement is practically nil. At the present time probably the greatest iron and coal deposits in the world are in China. These are not worked to the extent of one-fifth of 1 per cent. In fact, great veins of coal outcrop from the mountain sides and are not even dug into. So few railroads and no way to get to market with the products. Most of their transportation is by the wheelbarrow and on some roads that, in certain seasons, are ravines and quagmires. "Build no railroads nor let foreigners do it, for that will interfere with our ancestors' graves and with our ancestor worship," they say. So it is easily seen what great difficulties are to be met before China can be brought out into the sunlight of the twentieth century. She is trying to work out her destiny as a republic, instead of a monarchy which, under dynasties stretching back fifty centuries or more to times of fables and myths, has been of late years at times totally inadequate. Other nations have suggested and helped and her endeavors have been encouraged. It is hoped that the present time is the crimson dawn of a brighter day that will shed its radiance on this land of strange contradictions on the other side of the world.

SCIENTIFIC AND TECHNICAL ABSTRACTS

OUT OF COAL TAR.—The neglected coal tar of a generation back—the refuse of the gas works in the mid-Victorian days—now assumes with dignity a most important place in the list of benefits which have accrued to man through the efforts of the science of chemistry.

Medicinal coal-tar products are now considered as essential to the national welfare. The highest technical skill and the most exhaustive research are required in the development and commercial production of these chemicals. The extent of business along this line is indicated by the fact that the total production of such products in the United States in 1923 was 3,273,085 pounds, and sales amounted to 2,995,448 pounds, valued at $4,702,253. The 1922 production amounted to 2,946,347 pounds with sales of 3,092,915 pounds, valued at $4,233,443.

STATISTICS OF FATS AND OILS, 1924.—The Department of Commerce announces that the factory production of fats and oils (exclusive of refined oils and derivatives) during the three-month period ended December 31, 1924, was as follows: Vegetable oils, 958,595,929 pounds; fish oils, 22,842,082 pounds; animal fats, 573,169,221 pounds; and grease, 96,562,913 pounds; a total of 1,651,170,145 pounds. Of the several kinds of fats and oils covered by this inquiry, the greatest production, 650,497,327 pounds, appears for cottonseed oil. Next in order is edible and neutral lard with 450,710,825 pounds; linseed oil with 211,953,636 pounds; tallow with 119,927,797 pounds; coconut oil with 53,954,482 pounds; and corn oil with 27,580,070 pounds.

The production of refined oils during the period was as follows: Cottonseed, 523,824,231 pounds; coconut, 40,429,157 pounds; peanut, 1,955,245 pounds; soyabean, 396,200 pounds; corn, 21,200,444 pounds; and palm kernel, 154,370 pounds. The quantity of crude oil used in the production of each of these refined oils is included in the figures of crude consumed.

THE GLUCOSIDE OF BIRCH BARK.—Proctor was the first to determine that the volatile oil obtained from birch bark (*Betula lenta* L) is identical with that obtained from *Gaultheria procumbens* L. He was not able to obtain the original glucoside in crystalline form, but gave provisionally the name "gaultherin" to it. His paper was published in AMER. JOUR. PHARM., 1843, *15*, 241. Schneegans and Gerock (*Arch. Pharm.*, 1894, *222*, 437) extracted a glucoside from the bark and preserved Proctor's name. They stated that the substance has the formula of one molecule of methyl salicylate and of glucose minus a molecule of water. Marc Bridel (*Jour. Pharm. Chim.*, [7], 1924, *30*, 304), reports an extended examination of the glucoside and obtained it in crystalline form. On the basis of the work of Schneegans and Gerock it has been customary to view the reaction by which methyl salicylate and a carbohydrate are produced from the birch bark, as the usual hydrolysis with one molecule of water, assigning to the glucoside the formula $C_{14}H_{18}O_8$. In 1923 Bridel extracted from the European species of Indian pipe (*Monotropa hypopitys* L) a substance yielding under the influence of dilute acids, methyl salicylate, glucose and xylose. He termed this substance "monotropitin" and gave the formula as $C_{19}H_{26}O_{12}$. The reaction is shown as yielding for each molecule of the glucoside plus a molecule of water, one molecule each of methyl salicylate, glucose and xylose. The fact that this substance is thus hydrolyzed by the same methods that hydrolyze gaultherin led Bridel to investigate the nature of the glucoside in birch bark. This is not readily obtainable in France. The curator of a botanic garden in which a tree was growing declined to permit any collection of bark. Bridel, however, through the kindness of Professor A. P. Mathews, of Cincinnati, obtained a considerable amount of a fresh alcoholic extract prepared by the Merrill Company by a method suggested by Bridel, but which need not be described here. His experiments are also given in detail in his paper as above quoted. His conclusions are that the substance in birch bark which yields methyl salicylate does not have the composition of gaultherin, and that Schneegans and Gerock were mistaken when they stated that glucoside of the bark has the composition of one molecule each of the ester and glucose minus a molecule of water. The fact is that the glucoside in the bark of *Betula lenta* L is identical with that extracted from the *M. hypopitys* L, to which Bridel gave the name monotropitin, and

the formula given above. It exists in the birch bark in the proportion of two grams per kilogram. This yield is much greater than that from the *M. hypopitys*. H. L.

Poisonous Bread Furnished to Prisoners of War.—T. Karantassis, a commissioned pharmacist in the Greek army, reports the examination of some samples of bread from a lot furnished to Greek soldiers, in custody of the Turks. Only a small amount of material was available, saved by one of the prisoners who was released under a cartel between the two powers. Many of his fellow soldiers had died in the prison, and he believed the bread was responsible. The examinations were made in the pharmaceutic laboratory of the army at Athens. Microscopic examination showed that the starch grains had been but little altered as the baking had been incomplete. Starch from darnel (*Lolium temulentum*) and doura (*Sorghum vulgare*) were found in considerable amount, the former being most abundant. The ash was high, indicating considerable mixture of mineral matter. The principal symptoms were headache, vertigo, nausea, vomiting, disturbance of vision, diarrhœa, coma and tremor. Death followed in many cases. A statement of facts has been submitted to the International Red Cross. It is possible that the composition of the bread was due to neglect of ordinary care in the harvesting of the grain, but it is by no means improbable that the Turkish authorities deliberately adulterated the food (*Jour. Pharm. Chim.*, [7], 1924, *30*, 313). H. L.

Germicidal Properties of Chemically Pure Soap.—Soaps prepared from pure fatty acids were found by Walker to differ markedly in their germicidal properties, although sodium and potassium soaps of the same fatty acid do not differ greatly in this respect. The lowermost members of the fatty acid series possess no limited or germicidal properties against the organisms tested. *Staphylococcus aureus* possesses marked resistance to the action of soaps, not being killed by any of them under the conditions of Walker's experiments. The pneumococcus shows marked susceptibility to the action of the laurates, oleates, linoleates and linolenate, being killed in fifteen minutes by a N/10,240 (approximately 1 : 50,000) solution of sodium laurate. A 1 per cent. solution of phenol is required to kill under the

same conditions. The streptococcus is killed by the same soaps as the pneumococcus although it does not possess the same extreme susceptibility. *Bacillus typhosus* is considerably more resistant to the action of soaps, although killed in fifteen minutes by twentieth to fortieth normal (1.5 to 0.5 per cent.) solutions of the soaps of the saturated acids, from lauric to stearic inclusive. A 1 per cent. solution of phenol is also required to kill under similar conditions. On the other hand, *B. typhosus* is markedly resistant to the soaps of the unsaturated acids, despite the strong action of the latter on the pneumococcus and streptococcus. Hence, these soaps show marked selective activity for the pneumococcus and streptococcus. The soaps of myristic, palmitic and stearic acids kill the pneumococcus, streptococcus and typhoid bacillus in about the same concentration, and hence exhibit no marked selective action. The laurates, in that they are strongly germicidal toward the pneumococcus and streptococcus, and at the same time show definite germicidal properties toward the typhoid bacillus, seem to possess the most general action as germicides. The marked resistance of *Staphylococcos aureus,* however, limits the use of soaps as general antiseptics. In common with other germicides, soaps act best at higher temperatures. No attempt is made to explain the germicidal effect of soap solutions although it may possibly be related to their depressor effect on surface tension.—*Jour. Infect. Dis., 35,* 519-616, 1924, through *Jour. Am. Med. Assoc.*

New Tests for Common Metals.—Unexpected advantage to inorganic analysis has developed by the discovery of complex organic synthetics that have special reactions with certain metals or inorganic groups. The discovery of the complex pyrrol derivative, which for convenience is known as "nitron," and which forms a sparingly soluble nitrate, is a case in point. Other cases are quite familiar in the technical laboratory. Some data along these lines have appeared recently in the *Pharm. Weekblad,* (1924, *61,* 1922). The original investigation was made by Spacu some time previous (*Chem. Zent.,* 1923, *94,* II, 380 *et seq.*), but the more extensive studies recorded in the *Weekblad* were made by Kolthoff and Hamer. Spacu had shown that cadmium, copper, zinc and nickel salts give with thiosulphate and pyridin precipitates having the composition $M(CNS)_2Py_2$ and Kolthoff and Hamer investigated as to how far this reaction could be applied for the detection of several common metals. The reaction

is carried out as follows: To 5 cc. of the solution of the salt are added 0.5 cc. of a 10 per cent. potassium or ammonium thiosulphate solution and 1 cc. of a 10 per cent. aqueous solution of pyridin. Lead, copper, cadmium, zinc, nickel, cobalt, manganese, iron(ic), mercury and aluminum salts were tested In a concentration of 100 mg. per 1000 cc., all these metals except mercury gave a precipitate. In the high dilution of 1 mg. per 1000 cc. only nickel and cobalt gave definite results. Substituting for the thiosulphate an alkali-halide, such as KBr., makes the reaction more specific, as only cadmium and zinc are precipitated in moderately dilute solution. K., and H. also examined the action of other substances, such as pyramidon and antipyrin. Their results are summed up as follows:

With a reagent containing pyridin and bromide, 5 mg. of cadmium or zinc in 1000 cc. can be detected with certainty.

With thiocyanate and pyridin all the metals of the ammonium sulphide group are thrown down.

Zinc and cadmium in concentration 100 mg. per 1000 cc. can be detected by a mixture of thiosulphate and pyridin.

By a mixture of pyramidon and thiosulphate, 1 mg. of copper in 1000 cc. can be detected by the appearance of a violet tint.

The bromide-pyridin mixture is especially adapted to the detection of zinc and cadmium.

Trials have been made in the laboratory of the Philadelphia College of Pharmacy and Science of the last-named test and satisfactory results obtained. The precipitates are distinctly crystalline when viewed under moderate magnification, but have not been found available for distinction between the two metals. The original article in the Dutch journal has been consulted in the preparation of this note, but the data have been taken mostly from an abstract in *Schweiz. Apo-Zeit.*, 1924, *62*, 755. H. L.

Distinction Between Crude Drugs by Fluorescence.—The phenomenon of fluorescence is usually explained as due to the conversion of light waves of certain length and rapidity into waves longer and slower, that is, a given radiation is carried towards the red end of the spectrum. Many substances possess this power, but most of them have a compartively feeble action. A few organic synthetics, especially resorcinolphthalein (fluorescein) have very marked power. Native calcium fluioride (fluor spar) and also native zinc silicate

fluoresce strongly. Under ordinary conditions, that is, with white light, the phenomenon unless quite intense is lost in the general illumination, but if ultra-violet light, which is invisible to human eyes, is used alone, feeble fluorescences can be detected. The difficulty in carrying out experiments along this line is principally due to the expensiveness of the apparatus at present available for the production of ultra-violet rays, and the fact that these rays are transmissible through only a few substances. Ordinary glass, mica, gelatin and celluloid, even in very thin films, stop the rays down completely. Pure cellulose, such as the commercial cellophane, transmits a moderate proportion. Quartz is one of the familiar substances that will transmit the rays with moderate facility.

A large and interesting field of research is open to those who will study the fluorescence of substances under illumination by a powerful beam of ultra-violet so transmitted that no appreciable amount of slower rays are present. A special glass is now available for this purpose. Some work has been done in France lately in studying the fluorescence of crude drugs. Bretin and Deulier (*Bull. Soc. Pharm.*, 1924, *31*, 630) record the results obtained by submitting some common drugs to the light of a mercury arc in argon, which is rich in the short rays. Distinct fluorescences were observed with resin of guaiac (mauve), colophony (yellow), some terpenes copaiba, Canada, Bordeaux (white); Venice (faint blue). The exterior of bezoin masses (Sumatra) gave no result but the interior freshly exposed gave a marked bluish violet. Cape aloes became orange yellow; Socratine, India and Barbadoes aloes brick red. Chinese rhubarb was not affected, but English rhubarb gave a chestnut brown tint. Comparisons of saffron with its usual adulterants did not give any distinct clue to the detection of these latter.

It is to be hoped that some of the electrical companies will devote research to the construction of comparatively simple and inexpensive apparatus by which rays beyond the visible spectrum in both directions—ultra-violet and infra-red—may be obtained without admixture of visible light or with but little thereof, and thus open up a line of investigation that may prove both interesting and valuable.

H. L.

WHY NOT NITROGEN?—The use of krypton for obtaining rœntgenograms has been recently suggested. It is stated that salts with

high molecular weight (bismuth subcarbonate, barium sulphate) are now being used for diagnosing various illnesses. These heavy salts introduced into the several cavities of the organism permit the obtaining of X-ray pictures with shadows locating the position ot the organs. The absolute inactivity of krypton from the chemical point of view gives it a superiority over the salts of bismuth or barium, which are more difficult to use than a gas. It is to be noted, however, that the ray impermeability of the heavy salts is decidedly more pronounced than that of the inert gases.

NEWS ITEMS AND PERSONAL NOTES

THE JONES FELLOWSHIP IN PHARMACEUTICAL RESEARCH.—Professor Anton Hogstad, of Brookings, South Dakota, a frequent contributor to this journal, and who is pursuing special research in American wormseed, was signally honored recently, when David F. Jones, a prominent pharmacist of that State, presented to the South Dakota State College, a $1000 fellowship.

Mr. Jones is nationally known as a pharmacist of high standing, keenly interested in scientific pharmacy and eminently successful in the conduct of that phase of his calling.

Mr. Jones stated that his two-fold purpose in establishing the fellowship was to stimulate and encourage the spirit of pharmaceutical research, and as a mark of appreciation for the research as conducted by Professor Hogstad during the past four years, especially in relation to the American wormseed problem.

Incidentally, it might be noted that the results of Professor Hogstad's investigations of the chenopodium problem will be published in this journal.

THE COMMONWEALTH STUDY OF PHARMACEUTICAL EDUCATION. (Bulletin No. 4.)—This is the fourth of a series of twelve monthly statements to be issued by the staff conducting this study. These bulletins are issued to acquaint the profession with the progress of the study.

The study of nomenclature divides itself into two distinct branches. The nomenclature I, to be able to read prescriptions; II, to be able to read the U. S. P. and N. F.

I. The nomenclature to be able to read prescriptions.

A prescription is divided into six parts, namely: the superscription, inscription, subscription, *signa,* name and address of doctor and name and address of patient. Only the first four are considered in the nomenclature study.

The superscription consists of Rx, which is an abbreviation for *recipe,* the imperative form of *recipio,* which means "you take" and is printed on nearly all prescription blanks. It has been ignored in this study except to observe the rules of syntax which it governs.

The inscription contains the names of the ingredients and their quantities. The ingredients are written in the genitive case and the quantities in the accusative case.

The subscription gives the working directions to the pharmacist.

The *signa* gives the directions for the patient to be written on the label by the pharmacist.

The studies showing the Latin necessary to be able to read a prescription are as follows:

(a) Latin used in the subscription and *signa* of 10,000 prescriptions.
(b) Latin used in designating quantities of the ingredients found in the same 10,000 prescriptions.
(c) Latin used in the titles of ingredients found in 16,000 prescriptions.
(d) Rules of syntax involved in the prescription.

A. Ten thousand (10,000) prescriptions collected from ten geographical centers were examined to discover what Latin terms were used. These prescriptions were divided into sets of five hundred (500) each, a *pro rata* sample from each center, and the paritive sampling method was used on them. That is, as each five hundred were examined, record was kept of the number of new terms appearing per five hundred to discover the point of vanishing terms.

Method.—Each term, or word, was written off as it actually appeared on the prescription on a small piece of paper and these were tabulated together under the proper heading. While the terms were being tabulated, record was kept of the forms in which they were written on the prescriptions. The variety of incorrect forms used by the doctors was amazing. The outstanding example was that of

the Latin word *"chartula"* which was written twenty-two ways in 437 times used.

The terms "ana," *"quantum sufficit"* and "ad" in the inscription were included here.

B. The same 10,000 prescriptions as for study A were examined to discover what terms were used in the quantities following the same method. After studying three thousand (3000) prescriptions, no new terms appeared. Only new forms infrequently appearing were encountered after the third thousand.

Sixteen thousand (16,000) prescriptions which include those used in studies A and B were examined to discover what nomenclature was used. The same method was employed as before. Each ingredient as it actually appeared was written on a small piece of paper and these were tabulated together under the official title. In this way, the frequency of the correct Latin title, English title, and synonym was shown. The abbreviations, whether written correctly or incorrectly, were combined under one heading of abbreviations.

The type of ingredient report shows the frequency of the number of times the Latin title, English title and synonym occurs whether written correctly or incorrectly.

All titles which began with the letter "A" except proprietaries were studied. A title to be in correct Latin should be in the genitive case since the inscription of a prescription is in the genitive case. In some instances the synonym was Latinized and therefore it was recorded in two places. First from the standpoint of showing the Latin, secondly, of showing the synonym.

The results of the study on titles beginning with the letter "A" were as follows:

1.	Times it appeared in correct Latin,	12.5%
2.	" " " " incorrect Latin,	16.5%
3.	" " " " correct English,	11.1%
4.	" " " " incorrect English,	3.1%
5.	" " " " correct synonym,	11.1%
6.	" " " " incorrect synonym,	4.8%
7.	" " " " abbreviated form,	40.9%

Here again, the variations in forms for writing titles is very interesting. The ingredient Aspirin or Acidum Acetylsalicylicum was written in 129 ways; Calomel, Hydrargyri Chloridum Mite in 108 ways, and Sodium Bromide, Sodii Bromidum in 104 ways.

D. The first fifty prescriptions were translated into full correct Latin, then all the rules of syntax were drawn off. This then was repeated for two more sets of fifty each when it developed nothing new appeared. These rules will be part of the finished report.

II. The Nomenclature to be able to read the U. S. P. and N. F. This study divided itself into two groups, namely: 1, the vocabulary of terms; 2, rules of syntax.

1. The U. S. P. and N. F. was studied and each word or term was recorded with its particular form. This gives us a frequency of terms used.

2. The U. S. P. and N. F. studied and each rule of syntax which was involved was listed.

DR. WILLIAM F. HILLEBRAND, DECEASED.—Dr. William F. Hillebrand, for many years associated with the Bureau of Standards, died on the afternoon of February 7, 1925, following a short illness. He was seventy-one years old, and is survived by his widow and two sons, William F. Hillebrand, Jr., an electrical engineer, of Palo Alto, California, and Dr. Harold Hillebrand, Professor of English at the University of Illinois.

For the past seventeen years Dr. Hillebrand had been chief of the Chemistry Division of the Bureau of Standards, and continued in active service up to the beginning of the illness that led to his death. He was an honored member of the National Academy of Sciences, was a past president of the American Chemical Society, and has held high official and editorial honors in the science of chemistry. His published papers evince a high degree of scientific and technical attainment. His master work on rock and mineral analysis has held and still holds a commanding position as the leading authoritative text in this field, in which for many years he specialized with such success. He was recognized as a world authority on inorganic analysis. His wise counsel has been in evidence many times in the chemical work of the Bureau of Standards and in the science of chemistry in general.

COLLEGE NEWS.—Founders' Day exercises of the Philadelphia College of Pharmacy and Science were held on Monday afternoon, February 23, in the auditorium of the College. The Senior Student

Orchestra of ten pieces furnished the musical setting, and there were also musical contributions consisting of a baritone solo by Harold C. Wrght, of the class of '26, and a tenor solo by John A. Borneman, B. Sc., class of '28, and an instrumental trio by Miss Pauline Pipkin, B. Sc., '26, 'cello; Samuel Dezenhall, Ph. G., '25, violin; Harry G. Schaeffer, B. Sc., '25, piano.

Short addresses were made by President Braisted and Deans LaWall and Sturmer. A short one-act play which had been written by Dean LaWall and directed by Mrs. Ada S. Capwell, Assistant Librarian, entitled, the "Shades of the Alchemists," was also presented by the Bachelor in Science students. In the evening the faculty gave a dance with the members of the Alumni Association and the Senior Class and B. Sc. and post-graduate students as guests. The Student Orchestra furnished the music for this event.

The students who took part in the play and who contributed the musical portions of the program are to be entertained as guests at the next Faculty supper to be held at the Hotel Longacre on Monday, March 30.

Among the outstanding events of Founders' Day was the presentation of a grand piano to the College by the class of 1925, President Malcolm Cox making the presentation in an appropriate speech, and the announcement of more than $30,000 pledged to the College campaign fund by the classes now in the institution. Other recent pledges amounting to some thousands of dollars were also announced as resulting from the work of the Field Secretary.

The withdrawal of the class President from College made it necessary to hold a re-election for the first year class, Mr. W. B. Anthony being elected President.

On Tuesday evening, March 10, the Philadelphia branch of the A. Ph. A. was held at the P. A. R. D. home, in which sales demonstrations were made under the direction of Professor Olsen, of the Wharton School of Commerce, University of Pennsylvania, who also conducts the Business Administration class in the P. C. P. and S. Some of the senior students who had participated in a similar demonstration in class work acted in the same capacity in the demonstration at the Association meeting.

The new catalogue outlining the three-year course to be instituted in September next will soon be out. The new course will contain two new laboratory periods, one in general chemistry and one in physics, besides a didactic course in English.

BOOK REVIEWS.

THE ELEMENTS OF COLLOID CHEMISTRY. By Herbert Freundlich. Fellow of the Kaiser Wilhelm Institute of Physical Chemistry and Electrochemistry, Honorary Professor in the University of Berlin. Translated by George Barger, F. R. S., Professor of Medical Chemistry in the University of Edinburgh. Published by E. P. Dutton & Co., New York. 202 pages and index. Illustrated with diagrams. $3.

The total volume of literature on colloids in the fifty-year period from Graham in 1861 until the appearance of the little book of Pöschl, translated into English by Hodgson in 1910, was considerably less than that which has appeared in the fifteen-year period since the later date.

Probably the most valuable portion of this literature has appeared as current contributions to journals dealing with chemistry and with physics.

Every few years, however, an interesting book upon the subject appears in which is recorded a certain amount of the progress that has been made. Each book seems to be slightly different from all of the rest. Hatchek's two little volumes in 1913 and 1915 were very elementary. In 1917 Spear translated Zsigmondy's work and Fischer performed the same service for Ostwald. These were much more elaborate works and supplemented each other splendidly so that the person who was not actually working in this fascinating field could comprehend the basic principles and understand the terminology.

In 1919 Bechold translated Bullowa's work on the interpretation of the significance of colloids in medicine; in 1923 Clayton published an interesting little book on Emulsions and Emulsification, and in 1924 Alexander's book on Colloids in the Industries appeared. These were works dealing with specialized knowledge in connection with colloids and opened up new vistas to their readers. Others appeared besides those mentioned, but they will serve to exemplify the progress that has been made.

This recent book of Freundlich's is planned on different lines from any book that has previously appeared. To present the facts and theories concerning colloids in a form devoid of recondite mathematical deductions and bewildering numerical data is no mean effort

and in this the author has achieved success if systematic arrangement and lucidity of presentation are proper criteria upon which to base judgment.

From the purely speculative viewpoint all works on colloids are thus far incomplete. When we have three factors which are to be arranged in pairs, our mathematical instincts welcome six possibilities. No more than five of these have yet been included by experimenters and theorists in this field. The factors are the solid liquid and gaseous states of matter. The possibilities as stated, and as confirmed by observation are as follows:

Liquid	—gaseous—	exhibited by	foams.
Liquid	—liquid —	" "	emulsions.
Solid	—gaseous—	" "	absorption of gases by solids as charcoal.
Solid	—liquid —	" "	ordinary sols—as of metals.
Solid	—solid —	" "	ruby glass.

The unclassified possibility is that of gaseous-gaseous. Who knows what undetermined factors of meteorogical significance are involved in this unrecognized contingency?

Freundlich's book—as translated by Barger is full of information for the curious and full of possibilities for the speculative. One who reads it has added materially to his store of knowledge and if he is of a philosophic turn of mind, to his opportunities for mental exercise.

Simple and logical in its arrangement, comprehensive in its scope and understandable in its language, it is a welcome addition to the crystallized literature upon the subject. C. H. L.

THE EXTRA PHARMACOPŒIA. Revised by W. Harrison Martindale, Ph. D., F. E. S., and W. Wynn Westcott, M. B. Lond, D. P. H. Eighteen editions in two volumes. Vol. I, 1163 pages, 27s. 6d. H. K. Lewis & Co., Ltd., 136 Gower Street, London, W. I.

Just off the press is Volume I of the new Martindale! When the first edition was published in 1883 it was an unpretending volume of 313 pages. Since then a new, revised and enlarged edition has appeared about every two or three years, truly a sign of the usefulness and popularity of this work. Since the issue of the seventeenth

edition in July, 1920, painstaking research of divers kinds has been conducted, both in purely chemical subjects and in physiological chemistry, and many advances in medical treatment have been made as fruit of these investigations. All of this, together with the progress in pharmacy and the publication of several new pharmacopœias and supplements has been incorporated in the present, eighteenth, edition.

The preface of the volume, twenty-eight pages, is chiefly devoted to the recent changes in therapy. This "brief résumé," as Martindale modestly names it, is indeed a masterly review of the progress in therapy. The list of abbreviations occupies five closely printed pages and includes U. S. P., N. F., U. S. D. and many other American pharmaceutical and medical texts and also journals.

The main part of the book, 803 pages, is devoted to monographs on Materia Medica, official and non-official, in alphabetical arrangement. How thorough these monographs are prepared can be observed by selection, by haphazard, the one on Creosotum, pages 392 to 399: Official Titles in different Pharmacopœias, Dose Solubility, Constituents, Commercial Varieties. (Tests will be given in Vol. II.) Flavoring, Uses, Incompatibilities, Pharmaceutical Preparations as Aquae, Olea, Pilula, etc., and Chemical Preparations, as Creosote Carbonate and Valerianate and Guaiacol, Benzoate, Carbonate, Cinnamate and Iodide, and also Potassium Guaiacol Sulphonate and Calcium Guaiacol Sulphonate. Truly, a quart of information in a four-ounce bottle!

These excellent monographs are followed by Supplementary Drugs, pages 804-867, Vaccines and Antitoxins, pages 868-943, and Animal Organotherapy, pages 944-974. This is followed by Blood Transfusions, Table of Infectious Diseases, Poisons, Dangerous Drugs Act, 1920, Venereal Disease Act, 1917, Dentists Act, 1921, and Trade-marks. The Therapeutic Index of Diseases occupies pages 1005-1062, and Antidotes to Poisons, pages 1063-1068. The General Index and Posological Table occupies pages 1071-1163, closely printed in double columns and contains almost 10,000 items.

Volume II will not be ready for some time, but meanwhile the one of the seventeenth edition can be used, as there will not be many changes. The Extra Pharmacopœia of Martindale and Westcott is a masterwork! It is the incomparable and also indispensable authority and companion to both pharmacist and physician. How a phar-

macist in his daily routine can get along without this work, the referee cannot conceive! Let us hope that the new edition of "Martindale" will become still better known in the United States!

OTTO RAUBENHEIMER, PH. M.

AN INTRODUCTION TO THE STUDY OF THE COMPOUNDS OF CARBON OR ORGANIC CHEMISTRY. By Ira Remsen. Revised and enlarged with the collaboration of the author by W. R. Orndorff, Ph. D. 12mo., 567 pp. D. C. Heath & Co., New York, Boston and Chicago.

Everyone knows of the pre-eminent reputation of Dr. Ira Remsen. He is one of the fathers of chemistry in the United States, in fact, of America. He became the first professor at the first institution established in America for post-graduate work, namely, Johns Hopkins University. He was the founder of the *American Chemical Journal,* the first of its kind in America, established in 1879. As teacher, as research worker, as author and writer, he is probably most directly responsible for the remarkable development of chemistry in the United States.

The first edition of the book was published in 1885, followed by numerous editions since. The work became very popular and has also been translated into German, French, Spanish, Italian and Russian. The present up to date edition has been jointly prepared by the author and one of his former students, Dr. W. R. Orndorff, now Professor of Organic Chemistry, Cornell University. The book abounds with structural formulas, and rightly so, as organic chemistry is to a large extent structural chemistry. Without this aid the subject would be greatly confused, in fact confounded.

The text is full of cross-references in heavy-faced type in parentheses, a very valuable aid to the student. References in the form of footnotes are also given when deemed necessary. A decided change has been made in the present edition by omitting the laboratory experiments, which, however, will be published separately as a Laboratory Manual by Professor Orndorff.

How thorough the book has been prepared can be judged from the index, occupying twenty-three double-column pages. Let us hope that Remsen's Organic Chemistry will continue to live for many years to come!

OTTO RAUBENHEIMER, PH. M.

COLLOID CHEMISTRY. An introduction, with some Practical Applications. By Jerome Alexander, M. Sc., Consulting Chemist and Chemical Engineer. Illustrated. Second edition. 12mo., cloth, 208 pages, $2. D. Van Nostrand Co., New York City.

Colloid Chemistry, the latest branch of chemistry, "the fascinating twilight zone between physics and chemistry," as the author properly expresses it, is increasing in importance and popularity from day to day. The well-known author has made an enviable record in research in this field and is fully equipped to speak as an authority. The favorable reception accorded the first edition of the little book, published in 1918, stimulated the author to greatly enlarge and extend the present, second edition, both in the theoretical and the technical sections, so that it may be used as an adjunct in teaching colloid chemistry, and even as a textbook. The subject is presented in a simple, coherent and interesting manner, in, as far as possible, a non-technical language, together with handy illustrations. For these various reasons the book should have a large circulation and should arouse more interest in colloid chemistry.

OTTO RAUBENHEIMER, PH. M.

PRACTICAL CHEMICAL ANALYSIS OF BLOOD. By Victor Caryl Myers, M. A., Ph. D., Professor and Director of the Dept. Biochemistry, N. Y. Post-Graduate Medical School and Hospital. Second revised edition. Illustrated. Octavo, 232 pages. $5. C. V. Mosby Company, 508 North Grand Boulevard, St. Louis, Mo.

Just the kind of a book which is needed, a *"Practical* Chemical Analysis of Blood." The author is a recognized authority on this subject and therefore the given methods can be followed with security. Since the publication of the first edition many advances have been made which have been incorporated in the present book. From the following twelve chapter headings the scope of this excellent work can be appreciated: Introduction, Nonprotein and Urea Nitrogen, Uric Acid, Creatinine, Blood Sugar, Acid-Base Balance of the Blood, Cholestrol, Chlorides, Folin and Wu System of Blood Analysis, Miscellaneous Blood Determinations, Chemical Blood Analyses, Their Clinical Use and Interpretation and Quantitative Micro-Methods of Urine Analysis. The method for Uric Acid given in Chapter III is the new

and very simple method of Benedict. The new Chapter X discusses various miscellaneous determinations not included in the main part of the book, and gives methods for such determinations as hemoglobin, oxygen capacity and content, calcium, inorganic phosphorus and acetone bodies. At the end of each chapter Myers gives a very complete bibliography, which is of great value in a work of this kind.

The appendix gives a rather full discussion of types of colorimeters and their use, an alphabetical list of standard solutions and reagents, tables of atomic weights and metric equivalents, and a four-place logarithm table to aid in calculations.

The book is true to its title, "Practical" and we can therefore highly recommend it.

OTTO RAUBENHEIMER, PH. M.

CHAIN STORES, THEIR MANAGEMENT AND OPERATION. By Walter S. Hayward, A. M., Research Engineer, and Percival White, A. M., Research Engineer, with chapters by John S. Fleek, M. B. A., and H. MacIntyre. First edition, second impression; 12 mo., 411 pages; cloth. $3.50. McGraw-Hill Book Co., 370 Seventh Ave., New York City.

The purpose of the book before us is to set forth the principles of chain stores operation, organization, management and control. It is intended not only for the use of the executive at chain store headquarters, but also to the branch store manager and his assistants. The book will also prove of interest, in fact stimulating, to independent retailers and others who realize the possibilities offered by the chain store movement. Also this movement is still in its infancy. The chain store is probably the most highly developed example of modern distribution methods.

The book is divided into the following parts, the number of chapters being given in parentheses: Introductory (2), Physical Aspects (2), Merchandising Problems (7), Personnel (4), Control and Expansion (5) and Varieties of Chain Stores (6).

Chapter XXIII, comprising twenty-one pages, is devoted to the Drug Store Chain and treats the subject under the following headings: The Louis K. Liggett Co., Analysis of Drug Chains, Amount of Business Done, Location, The Product, Advertising, Sales Policies and Conclusions. One of the latter, No. 4, states: "The chain

drug store has an advantage over its independent competitor in location, sales turnover, advertising, management and a knowledge of the principles of retail store operation." This seems to apply that the chain drug store is assured of success. However, many instances throughout the country, including a personal experience of the referee, have proven that chain drug stores established near independent pharmacies, were a complete failure. After all this is a survival of the fittest!

The book is well worth reading, as it contains a lot of information which can be put to good use by drug store owners and salespeople.

OTTO RAUBENHEIMER, PH. M.

JAMES DEWAR. By Henry E. Armstrong. 32 pages. 1s. 6d. Ernest Benn, Ltd., 8 Bouverie St., London, E. C. 4.

Sir James Dewar, the Scotch scientist, was born on September 20, 1842, and died at the Royal Institution, London, on March 27, 1923. The print before us contains a Friday evening lecture to the members of the Royal Institution on January 18, 1924, delivered by the well-known chemist, Henry E. Armstrong. It is a complete biography of Dewar and a valuable contribution to the history of science. Opposite page 22 there is reproduced in facsimile, one of Dewar's letters to Armstrong, as an example of his characteristic handwriting and style. As Dewar and Armstrong were friends the words of Dr. Johnson were taken as the motto: "We cannot trust the characters of history unless they are drawn by those who know their persons."

OTTO RAUBENHEIMER, PH. M.